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the GEOGRAPHICAL MAGAZINE

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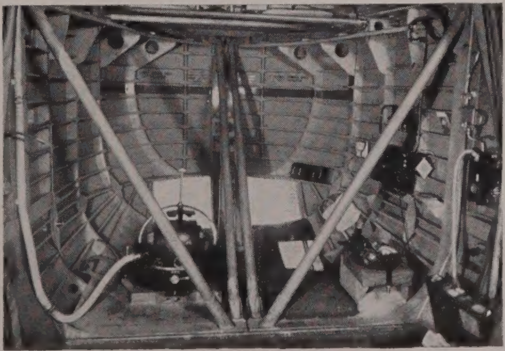
(Above) *An air survey flying team, pilot and photographer, plan a flight over the City of London*

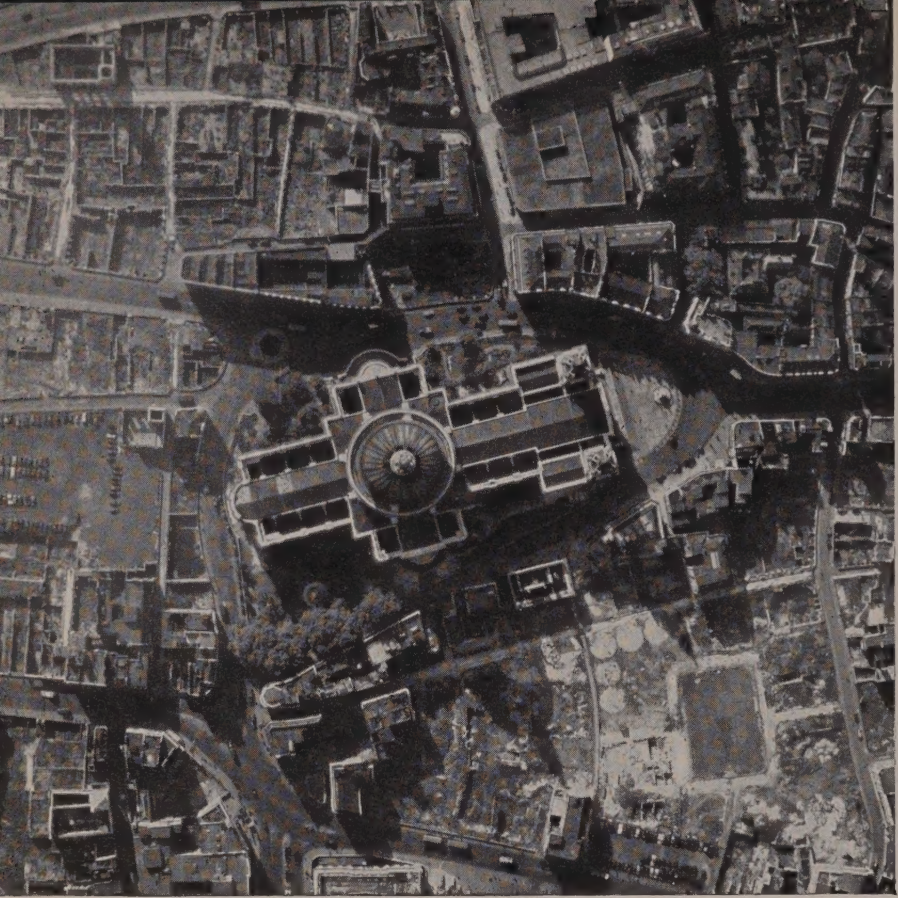
Maps from Air Photographs

by T. D. WEATHERHEAD

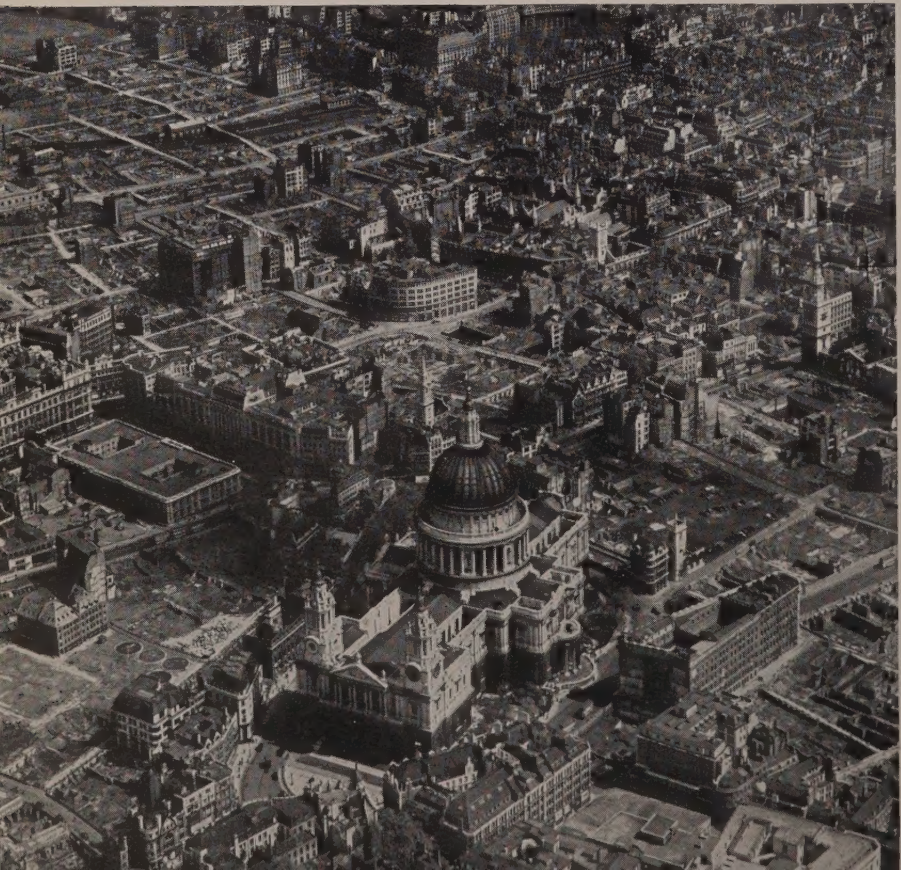
The photographs illustrating this brief description of how maps and models are made from air photographs were taken in the Elstree Laboratories of Hunting Aerosurveys Ltd. This firm started life under the name of Aerofilms Ltd. in 1919, when the taking of photographs from the air was still a novelty. It later became associated with the Aircraft Operating Company, vertical or survey photography was then first carried out. At the outbreak of war the company was taken over by the R.A.F. and became the nucleus of the Allied Central Photographic Interpretation Unit. Hunting Aerosurveys has associated companies in Canada, South America, Africa, Australia and New Zealand. Air photographs, through the making of maps and models and in other ways, are now becoming indispensable to engineering, town-planning, geology, forestry and agriculture

(Below) *The air photographer's compartment of a specially adapted aircraft. On the left is the electrically operated survey camera enclosed in its perspex dome, into which a hot-air pipe is introduced. The photographer lies to the right with his equipment close at hand*



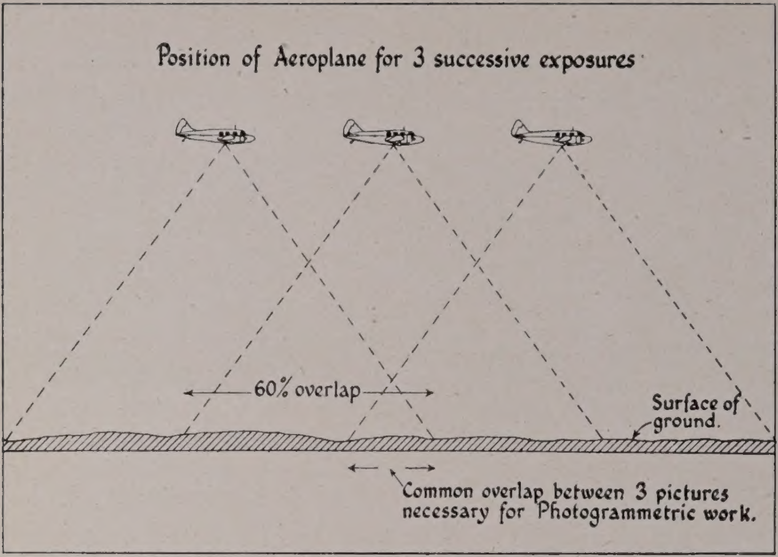


Air photographs are of two main types: those taken with the camera pointing directly down through the floor of the aircraft and those taken with the camera pointing obliquely at the objective. The vertical photograph (left) *of St Paul's provides a plan view in which surrounding roads and buildings can be seen. Although at first the vertical photograph is harder to understand than the—*

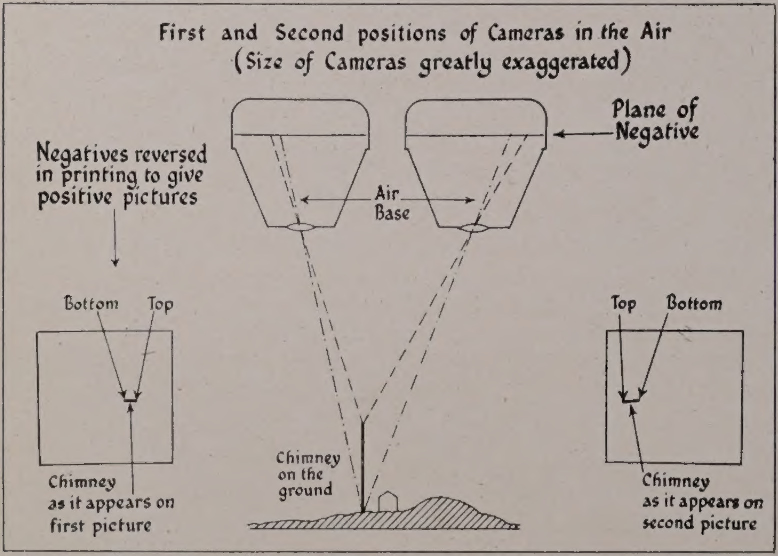


—oblique, it is used for nearly all mapping work; for considerable areas are hidden by the buildings in oblique photography, which is, however, very useful in the construction of models and town-planning. The oblique 'shot' (left) *of St Paul's gives the more familiar view; its location is immediately recognized by details of the sides of buildings, which vertical photographs cannot include*

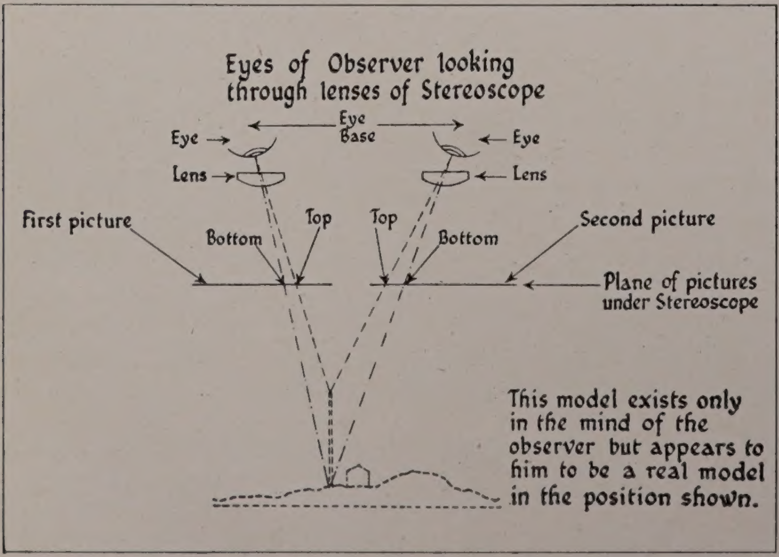
Different types of cameras are used for oblique and vertical photography. For the mapping work an electrically operated camera that holds a magazine of 250 negatives, nine inches square in size, is used. Directly after the photography has been completed the film is carefully developed and a set of contact prints is made


Position of Aeroplane for 3 successive exposures
60% overlap
Surface of ground.
Common overlap between 3 pictures necessary for Photogrammetric work.

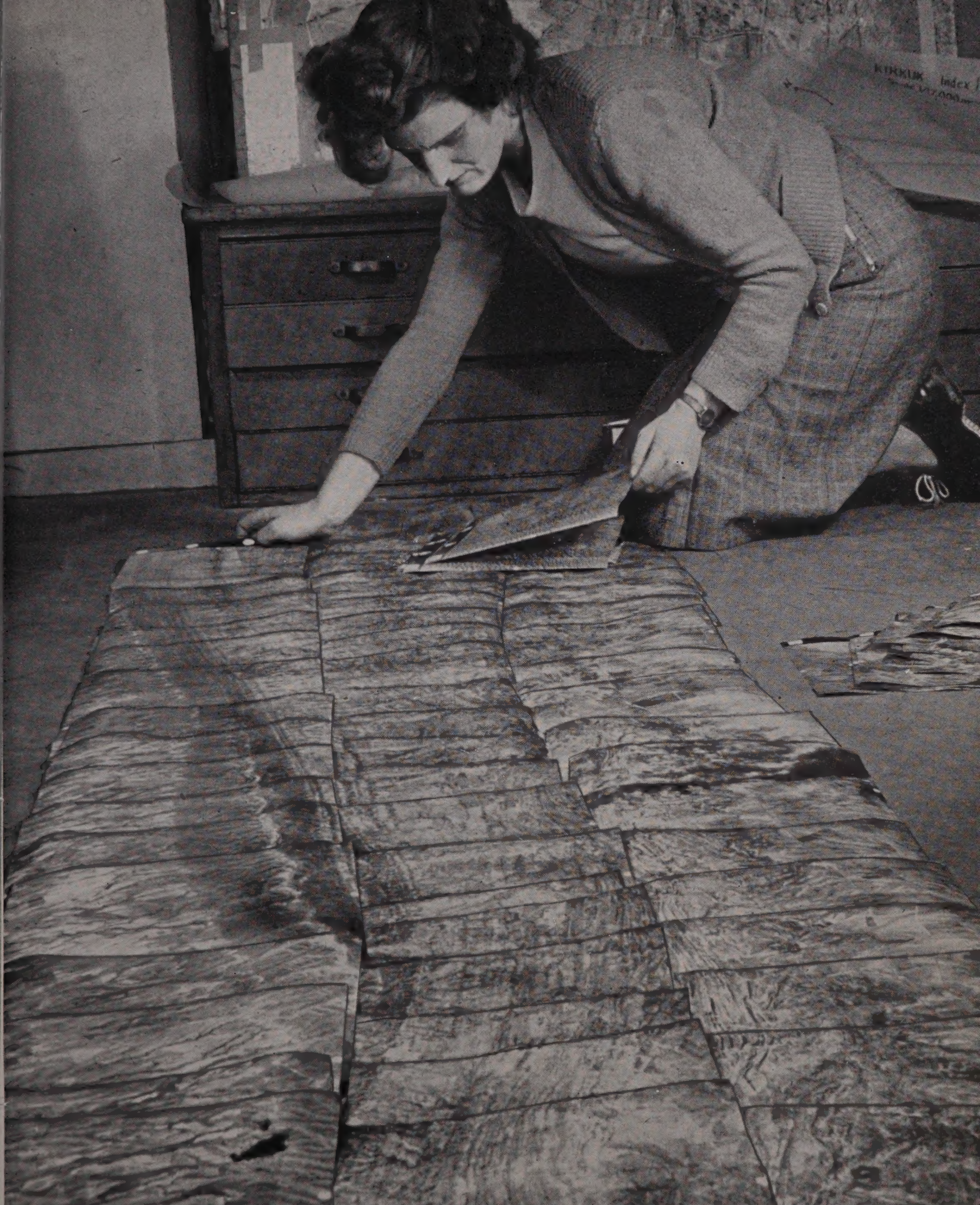
When taking vertical photographs for mapping, the aircraft is flown on a straight and level course. The camera is operated at a pre-arranged time interval so that the area covered by every photograph overlaps the area of the previous one by about 60 per cent


First and Second positions of Cameras in the Air
(Size of Cameras greatly exaggerated)
Plane of Negative
Negatives reversed in printing to give positive pictures
Air Base
Bottom
Top
Top
Bottom
Chimney as it appears on first picture
Chimney on the ground
Chimney as it appears on second picture

Since every object on the ground is photographed from two different positions in the air, each photograph gives a different angle of view of each object. This simplified diagram shows the two views of the same chimney obtained in consecutive photographs

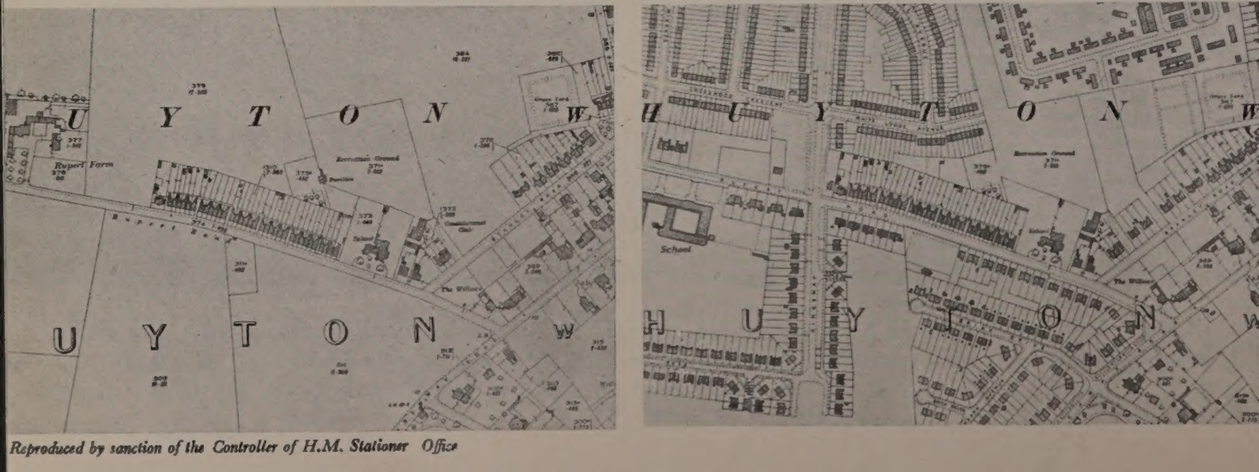

Eyes of Observer looking through lenses of Stereoscope
Eye
Eye Base
Eye
Lens
Lens
First picture
Bottom
Top
Top
Bottom
Second picture
Plane of pictures under Stereoscope
This model exists only in the mind of the observer but appears to him to be a real model in the position shown.

In studying a pair of vertical overlapping photographs through the two lenses of a simple stereoscope, each eye sees a slightly different view of each object and an impression of relief and depth is thereby created; just as in normal vision the different views obtained by each eye are fused together in the brain



When a large area has to be photographed the aircraft flies a series of parallel strips so that each line of photographs overlaps the adjacent one by about 25 per cent. Subsequently the prints must be checked carefully to ensure complete coverage of the area, correct forward and lateral overlap, and satisfactory quality

(Above) *One of the steps in revising the Ordnance Survey 1/2500 plans. From the negatives covering the area to be revised a rectified enlargement is made to the scale of the O.S. plan. Tracing paper and a carbon sheet are placed under the enlargement and, by delineating with a fine-pointed stylo all the details on it that are new, a trace is prepared which is then fitted into the existing detail on the plan and fair drawn.* (Below, left) *The 1927 plan of Huyton.* (Below, right) *The 1947 plan, revised by the method described above*



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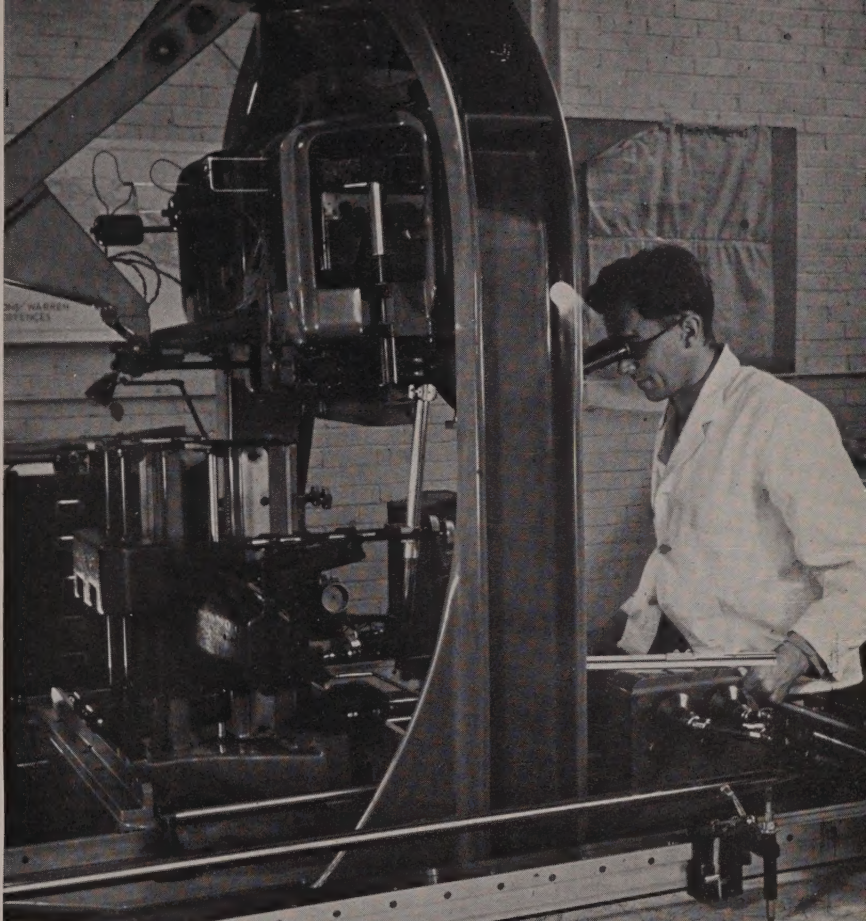
In order to prepare accurate large-scale plans or contoured maps from air photographs a three-dimensional plotting instrument, such as the Wild Autograph A.5 (right) *is used. Before plotting is begun the photographs have to be orientated to points for which the plan and height values have been established by the ordinary ground survey methods. An operator is here seen studying through the binoculars the pair of overlapping photographs*



By turning two wheels and manipulating a foot pedal he can move a reference mark in the optical system in either a horizontal or vertical plane through the three-dimensional model being studied. The movements of the reference mark are geared to (left) *a plotting pencil on the adjoining table. With this type of instrument can be produced contoured plans up to scale 1/1250 with 5-foot contours, and plans without contours of particular areas to even larger scales*

By combining the stereoscopic study of air photographs with information obtained from the map it is possible to construct scaled models. The land-form is built up from the photographs and map and then a photographic skin is stuck down on it; this provides the plan position of all features. The height and shape of every house and tree can be seen and accurately reproduced after a stereoscopic study of the photographs. (Left) *Part of a model of the Balmoral Estates, which was made for H.M. the King*

The Northern Greek Frontier

by MICHAEL WARD

As a member of a United Nations Observer team, Mr Ward saw at first hand what is happening at one of the chief points of impact between the two great power-groups operating in the world today. Many of our readers will appreciate how closely his interpretation of these events corresponds with the geographical definitions set forth by Sir Halford Mackinder more than thirty years ago

"WHOSOEVER is not Greek is barbarian." This proud saying of the ancients, spoken with an eye on the uncivilized hordes which milled around to the north and east, might with equal application be put into the mouths of the modern Greeks, for once more, twenty-four centuries later, their eyes are turned with apprehension to that mustered northern might which they feel may invade their land and engulf in an alien despotism the traditions of civilization which they enjoy and derive from their own ancient past.

Greece's critical preoccupation with her northern frontier has been in the news since 1945, when the Russian consolidation in the Balkans was followed by the installation of "People's Republics" in Albania, Bulgaria and Yugoslavia, and an outright attempt by the Communist-led Greek guerrilla army of ELAS, which during the war was deliberately prepared for that purpose as well as for resisting the enemy occupation, to foist a similar régime onto Greece by force of arms. The British part in championing Greek independence and in helping to put down the 1944 revolution brought the whole situation for the first time into the limelight, and revealed that here was no mere question of domestic Greek politics, but a clash of interests between the rival power-spheres represented by Britain and Russia. Since that time the U.S.A. has entered the field by underwriting and finally in great part taking over British commitments in Greece.

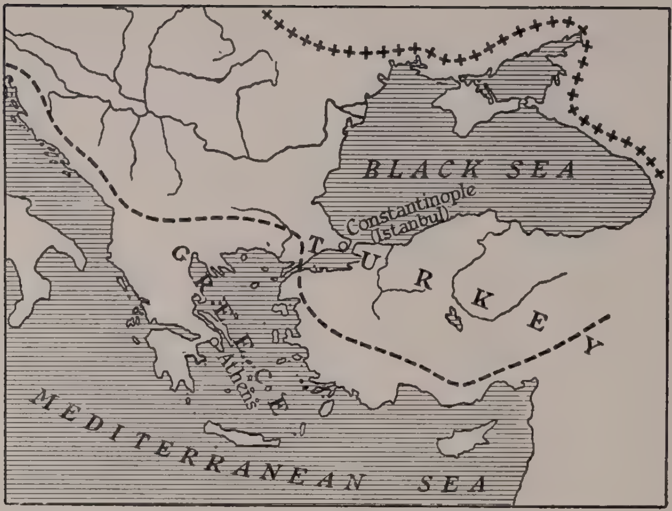
This conflict of power in Greece thus appears to be a development of recent years. In fact it has existed ever since ancient Greek society, based on its sea-power, established civilized communities round the Greek peninsula and along the seaboard of Asia Minor. Then, too, the inland penetration of Greek influence was arrested at a line where it came into contact with the downward and outward pressure of the vast group of peoples circulating in the Asiatic steppe-lands and the Danube basin. The establishment of the centre of Greek influence at Constantinople during the Byzantine era may be regarded as a thrust of sea-power northwards as a bulwark against the centrifugal urge of the barbaric hordes.

The 19th century saw Western European, mainly British, sea-power well established in the Mediterranean and, with Anglo-French assistance to the Greek Independence movement, the extension of sea-power to embrace, especially, the Greek peninsula and the northern waters of the Ægean. Thenceforward the sea-girt country became the northern bastion of sea-power in the eastern Mediterranean.

What invests the position of Greece and Turkey with such importance is the fact that they lie directly athwart the southward course of any expansion by a northern power towards warm-water ports and towards Suez, the cross-roads of the world. History indicates that there is such a latent urge for expansion centred in that vast area which embraces the Slav, Turkoman and Mongol peoples. The sphere of sea-power in the Mediterranean impinges most directly upon this southward urge at two places—Greece and Turkey. Between the impact of these forces in the past and their impact today there is one great difference, namely, that the latent urge for expansion from the north is now being deliberately developed by the U.S.S.R., which has assumed an undisputed hegemony and infused its satellites with a militant creed.

Turkey, fortunately for the wielders of sea-power, remains as yet firmly resistant to northern pressure. It is in Greece, where the inland infiltration of sea-power abuts on a long front against the northern land-power, that most friction is created. The boundary line is necessarily dictated by a physical feature, the high watershed formed by the Rhodope, Belashitsa, Tzena and Kaïmakchalan mountain masses. This 7000-foot 'iron curtain' is the northern frontier of Greece.

Trouble on the frontier began to be evident during 1946, when ex-ELASites, who had fled to Albania and Yugoslavia after the failure of the 1944 coup, rather than lay down their arms in accordance with the amnesty



A sketch-map based on one illustrating Sir Halford Mackinder's Democratic Ideals and Reality (*Pelican Books*). *It represents the boundary of his "Heartland" when Mediterranean sea-power enters the Black Sea* (*crosses*), *and when land-power advances from the steppes to the seaward mountain ranges* (*broken line*)

offered them, seeped back to Greece in organized guerrilla groups. Their activities and numbers increased so alarmingly as to strengthen the belief that they were being encouraged and assisted from the north, and at the end of the year Greece brought the matter to the Security Council of the United Nations. The result of discussion therein was the establishment of a commission of eleven nations to investigate the situation on the spot, with authority to conduct its inquiries in Albania, Bulgaria, Yugoslavia and Greece.

This commission, and a subsidiary group which succeeded it, remained in operation till September 1947, carrying out its investigations in all four countries concerned. Its reports were then discussed by the Security Council, but Soviet vetoes of all proposals by others to solve the Greek problem brought about a deadlock, and there remained no alternative but to refer the matter to the General Assembly. This body, after the customary bitter exchanges, passed a resolution containing recommendations to Greece and her Neighbours to establish friendly frontier relations and exchange minorities, and set up a new commission to observe the extent of compliance with these recommendations and to act as an intermediary. It was to be based on Salonika and was composed of delegations from Australia, Brazil, China, France, Holland, Mexico, Pakistan, the U.K. and the U.S.A.

The U.S.S.R. and Poland, who were allotted seats on this commission, refused to fill them and boycotted it; their attitude was copied by Albania, Bulgaria and Yugoslavia, who stolidly refused to cooperate. In consequence the commission's work was from the beginning restricted to Greek territory.

This, the United Nations Special Committee on the Balkans, started to function in December 1947. The executive role was, and still is, filled by a group of observers drawn from most of the national delegations participating, and mixed into teams of about six each. To allow adequate coverage of the frontier there are five such teams, based respectively on Yannina, Florina, Kilkis, Kavalla and Alexandroupolis (eighty miles east of Kavalla), and responsible for interlocking sectors of the frontier north of these places. They maintain regular communication with the Committee in Salonika by road and air, the Committee employing its own Dakota, and each team has its own radio link. They are thus enabled to submit regular reports, which are the basis of the Committee's work.

The Observers' life is hard and hazardous. Based on their five provincial centres, they are rarely to be found there, but are perpetually busy travelling from one part of their sector to another to investigate alleged frontier violations, and frequently accompany Greek operations near the frontier, where it is anticipated that useful observations may be made. On these occasions they undergo the full rigours of mountain campaigning, preferring usually to accompany the forward troops, for better observation, and thus being subject to all normal battle-hazards.

Their yellow jeeps traverse the northern roads in constant danger of destruction by guerrilla mines, which are many and ubiquitous, but as the savage terrain has not favoured the development of many roads, much hard walking is necessary to reach and follow operations.

The task of the Observers, of whom I happened to be the first to take the field, is to watch the compliance or otherwise of all parties with frontier conventions. They are impeded in this by the fact that nine-tenths of

(Above) *Standing close to a stone shrine, such as marks the entrance to every village in Greece, a Greek sentry looks across the frontier to the tiny Albanian village of Kokovic which huddles under snow-capped Mount Mourgana. The frontier traverses much country as wild as that shown; in this instance the frontier, running from the foothills on the right to the peak of Mourgana on the left, is firmly controlled by guerrilla forces.* (Right) *A United States Observer, unable to approach the border last March, used binoculars for following operations watched by a French colleague and two Greek Liaison Officers*

All photographs by the author

(Left) *Yannina, capital of Epirus and erstwhile seat of the notorious Ali Pasha, remains predominantly Ottoman in appearance. The mosques and minarets of the old fort still dominate the town and its lake, while the streets are lined with Turkish houses which have iron balustrades and window-grilles of elaborate design, and jutting eaves. From March till September storks abound, fishing for young frogs by the side of the lake and rearing their young upon every roof-top*

the frontier and its approaches lie in mountain fastnesses well within guerrilla territory. Access to the frontier is only possible where the Army makes periodical thrusts, and at the few gaps and water rifts where it is able normally to occupy the frontier posts—abutting on Bulgaria near the Turkish border and at the Rupel Gorge of the River Struma; opposite Yugoslavia at Lake Doïran, the Vardar Valley and the Monastir Gap. The Greek Army touches the Albanian frontier at very few points and then only by virtue of current local operations.

In the course of their activities in the train of Greek Army operations the Observation teams have on repeated occasions witnessed flagrant violations of frontier conventions by the guerrillas in the sectors adjacent to all three of the Northern Neighbours. Guerrillas have frequently been seen to cross back and forth over the frontier line under tactical duress, and in the close vicinity of the Neighbours' frontier guards, who clearly connived at such extra-territorial movements.

Observers themselves have many times been fired at and on occasions wounded by guerrilla machine-guns and even artillery sited on non-Greek territory, especially in Albania. Motor convoys have been seen approaching the frontier surreptitiously at night with the object of bringing reinforcements and supplies to hard-pressed guerrillas.

This personal experience has convinced the Observers beyond the slightest doubt that Albania, Bulgaria and Yugoslavia are encouraging and aiding the guerrillas by conniving at illegal use of their territory. The guerrillas thus have the great advantage that they can always extricate themselves with impunity from the Greek Army's clutches, and subsequently seize the tactical initiative by infiltration to Greece in the flank or rear of the Greek forces.

Implications of a far deeper character concerning the involvement of the three Neighbours have, however, been raised as a result of another kind of activity of the Observers. This, the interrogation of any witnesses

(Right) *Kilkis, an agricultural town protected by the Greek Army, holds a market every Saturday. As in many Greek country districts wares are displayed on the ground. Here Macedonian women, in characteristic black head-shawls, are seen buying potatoes, which, with beans, cheese and home-made bread, comprise the villagers' staple foods. Eggs and poultry are plentiful, but peasants enjoy the luxury of lamb or kid only occasionally, and of beef almost never*

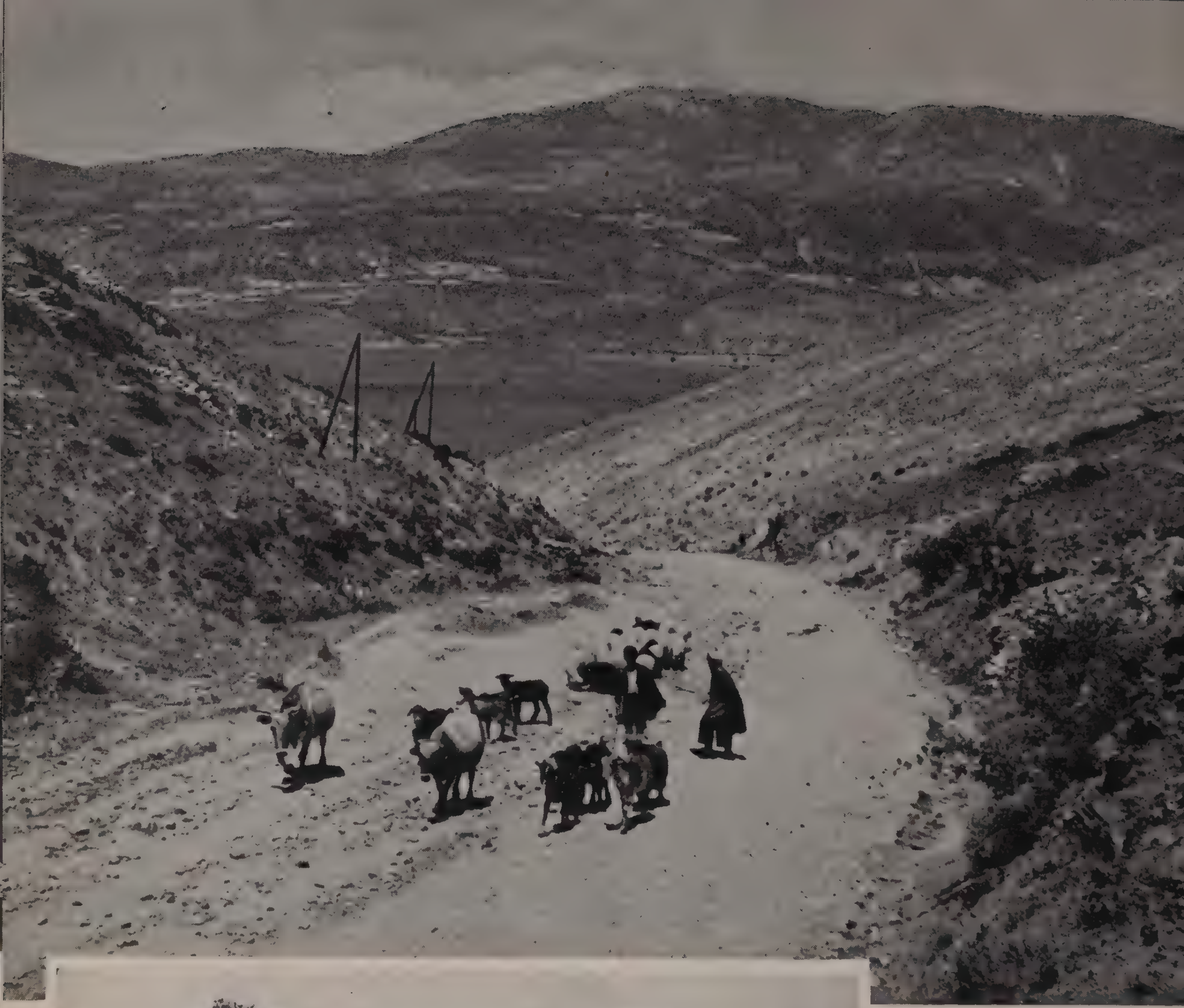
whom they consider useful, is carried on concurrently with their other tasks, and is intended to give them a clear insight into the social and political conditions existing in the frontier districts, particularly in guerrilla territory and in the countries to the north.

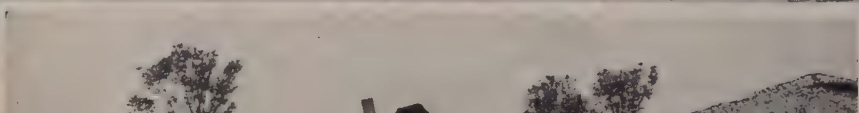
Thus, they may interrogate on the spot guerrillas who have been captured, or more frequently have surrendered, obtaining from them their personal history since joining the insurgents; or they may interview Greek peasants who have fled from guerrilla territory, or Greek Army men who have witnessed frontier violations during operations; or, finally, political refugees from the northern countries who have managed to escape their frontier guards' vigilance, and, after running the gauntlet through guerrilla territory, give themselves up to the Greek authorities.

Some 700 witnesses of all types had by last November been interrogated, and the number grows daily. Their evidence was collated and compared by the Committee in Salonika, and exhibited a quite remarkable degree of corroboration on all major and most minor issues. It implicated with equal force each of the three Northern Neighbours of Greece.

It revealed that those states are and have been guilty for two years of giving every sort of 'logistical' support to the guerrillas. Large camps are maintained, deep within their interior, where insurrectionaries are given training courses; hospitals and sanatoria are reserved for guerrilla wounded; road and rail transport to the Greek frontier is provided; arms, ammunition, food, clothing, and medical equipment are contributed, and public subscriptions raise funds for "General" Markos. The policy of aid to the guerrillas is revealed as being conceived and carried out by the three countries in common, guerrillas often passing in transit from one country to another for infiltration elsewhere on the Greek frontier.

There is also abundant evidence that all three states accepted many thousands of Greek children who were abducted by guerrillas from their homes in the early months of

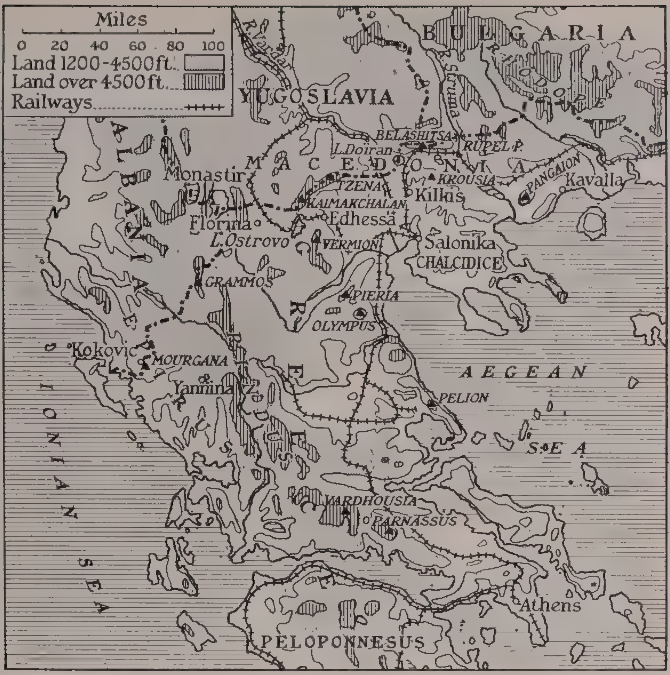




(Above) *A Greek shepherd and his son driving their mixed flock up to pasture above Lake Ostrovo. The north side of this lake, and Mount Kaïmakchalan (in the background) whose peak (8275 feet high) marks the frontier, are guerrilla-infested.* (Left) *Macedonian women, settlers from the Caucasus, having unyoked the oxen, chat round their cart while their husbands are busy at market*

1948 and are being educated in such a way as to perpetuate unrest on this troubled frontier.

It may be wondered where these guerrillas are recruited. The view has been widely disseminated that they consist of liberal-minded Greeks who have escaped authoritarian persecution to join Markos in the fight for democracy. The experience of Observers, however, and the evidence amassed make it clear that a large part of the guerrilla strength consists of harmless peasants from the border districts who are abducted forcibly from their villages, marched northwards across the frontier for training, and subsequently despatched in parties back to Greece, where many surrender at the first opportunity. The minority consists of a nucleus of Greek Communists and their sympathizers, who by methods of internal terrorism and armed threat bend the simple peasants to their will.



A. J. Thornton

The insurrectionaries retain control of most of the frontier mountains and of a band of territory stretching inland to a line conforming with the foothills, but they also use the many southward-running mountain chains as stepping-stones to establish themselves deep within Central Greece. Thus the long ridge of Pindus gives them access from Grammos, on the Albanian border, down to the massifs of Vardhousia and Parnassus, with many intermediate offshoots. From Kaïmakchalan, on the Yugoslav border, they cross by night to the spine of Vermion, and thence via Pieria to Olympus and Pelion. From Belashitsa they descend to Krousia, Pangaion and Chalcidice.

Along the band of guerrilla territory at the border there is a penumbra of no-man's-land where the Army is not permanently installed and into which the guerrillas make frequent sorties for forcible recruitment and foraging. Though the Army has greatly extended its control of foothill areas in the interior, the situation near the frontier remains parlous. In this no-man's-land economic life has come to a standstill. Agriculture has been abandoned, whole villages are deserted and local government and education have not the security to function. Half a million peasants, it is estimated, have moved as refugees to the towns where they are assured protection, but become a state liability.

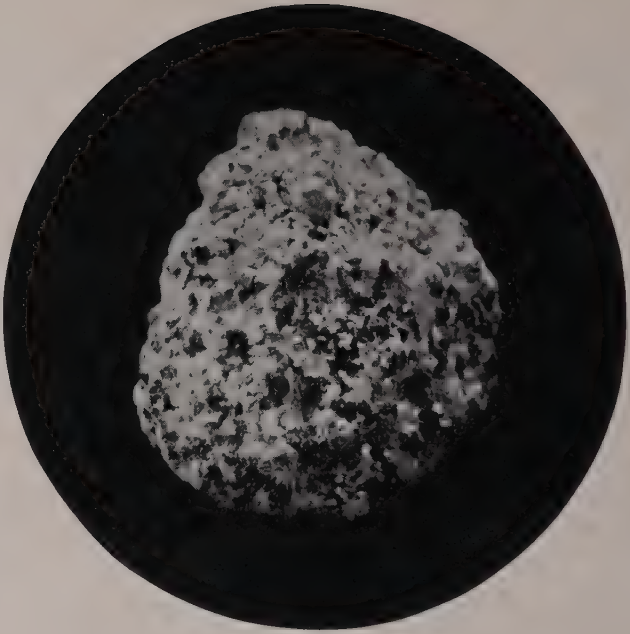
A complicating factor of the whole problem is the existence of many minorities with conflicting loyalties. For example, Macedonians speaking a Slavonic dialect in the Edhessa-Florina area harbour a fairly strong movement for autonomy and tend to look to Yugoslavia for support; while large communities of Greeks from Pontus and the Caucasus, resettled in the Kilkis district in 1924, have decidedly Communist tendencies, probably owing to depressed social conditions and governmental neglect ever since. These and other 'splinter' elements all help to recruit the 'sympathizer' type of guerrilla.

The future for Greece remains unsettled, for, though the Army may achieve notable successes, the guerrillas retain the initiative in the long run, thanks to their 'getaway' system. Infiltration from the north is always possible in that wild terrain, and it seems that the Army can at the most hope to consolidate the seaboard and confine insurrection to the immediate frontier area.

In the final analysis, as many Greeks have expressed it to me, "So long as the northern frontier represents also the frontier of two world blocs, Greece, an unhappy pawn, must expect continuing unrest". This remains true, even though the normal state of Greek politics suggests that their lack of stability has many other contributory causes.

Cornish China Clay

by VAL DOONE



(Right) *A lump of China Clay, or kaolin, taken from the pit face. It is formed when felspar, the binding material in granite, breaks down into a white clay. The dark spots are quartz and the light flakes are mica*

GRANITE is a plutonic rock, solidified under immense pressure at great depths below the surface. It is composed of quartz, mica and felspar, and is extremely hard; but in certain natural conditions the binding material, the normally hard crystalline felspar, breaks down into a white clay, kaolin or China Clay. Though granite is a widely distributed rock, this breaking down occurs, on a scale that makes commercial exploitation possible, at comparatively few places on the earth's surface; and since many industrial uses have been found for kaolin the few known deposits of it are worked extensively.

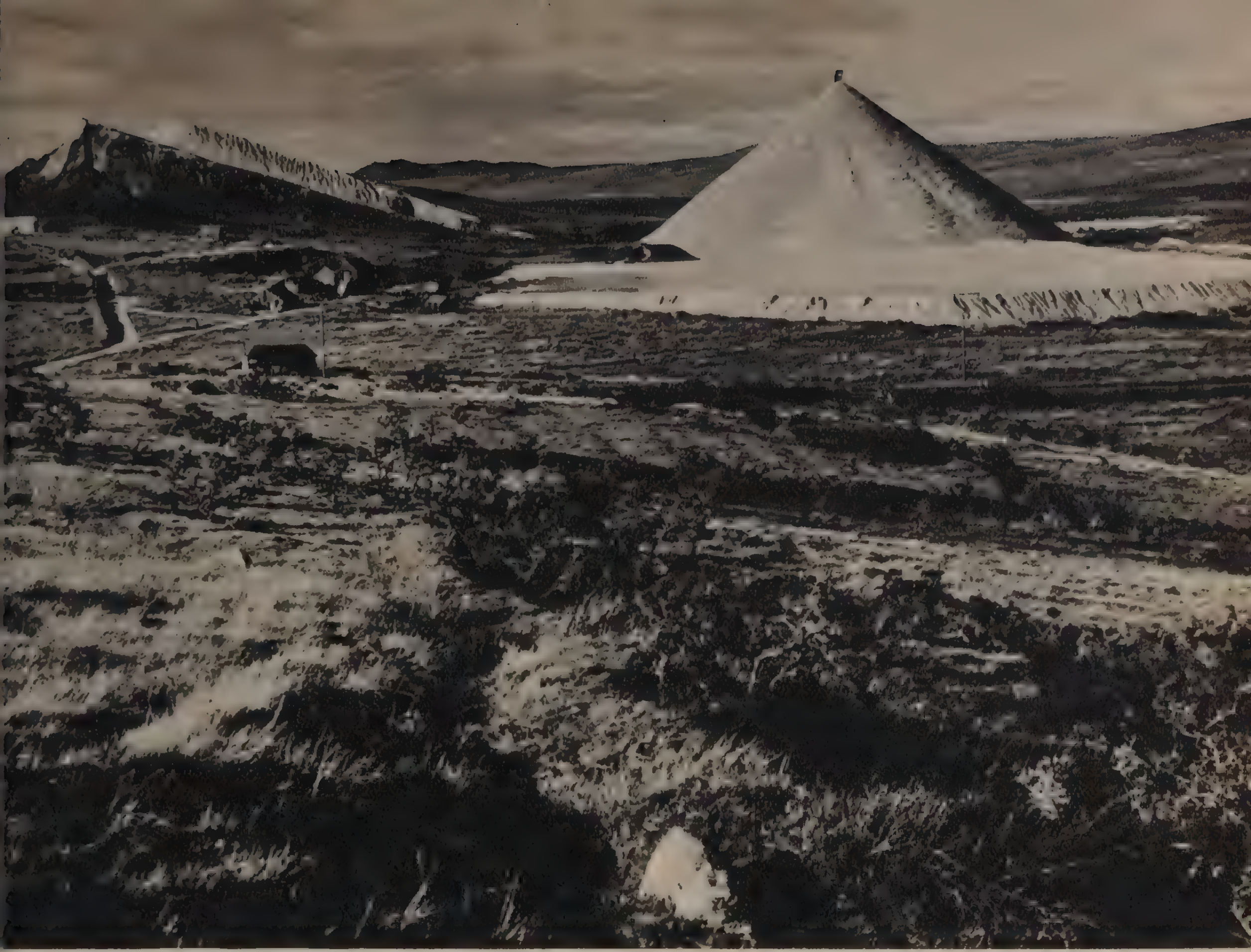
The greatest concentration of kaolin and its most intensive mining occur in Cornwall —on Bodmin Moor and more especially on the outlying spur of hills around St Austell. In essence the process of mining the clay and preparing it for commerce is simple. The accompanying illustrations show it carried out at the Great Hawks Tor Mine, on Bodmin Moor, the great pyramidical 'tips' of which are a familiar landmark to travellers on the road from Launceston to Bodmin.

There is at the Great Hawks Tor Mine an overburden of up to six feet of peaty soil, sharply divided from the clay which it covers. This is cleared from the clay and hauled, together with other waste from the mine, by cable trucks or 'skips' up to the peak of the overburden tip.

The kaolin is 'mined' by washing it out with water (known as 'wash') from pressure-hoses in an open pit. By stages which the photographs illustrate, quartz sand and mica are removed from the wash. The problem of disposing of its wastes, or at least stacking them out of the way of the mining operations, is a major one to the China Clay industry. For every ton of final clay product something like ten tons of quartz sand have to be disposed of. The scale on which material has to be dealt with is indicated by the dimensions of the Hawks Tor pit, as shown in the photographs. In most mines the mica waste is allowed to drain into rivers (hence the milky whiteness of many streams in the St Austell area), but at Great Hawks Tor it is contained in the great mica dam at the foot of the sand tip; river pollution is thereby avoided and a potentially valuable by-product is stored.

After treatment in settling tanks the wash, now containing only pure kaolin and known as the 'landing', is carried by gravity from the mine through eleven miles of pipe-line to the second section of the works, known as the 'Kiln', situated in the valley of the Fowey with rail sidings and main road adjoining.

The pipe-line from Hawks Tor discharges into storage tanks at the back of the Kiln. In these the landing settles further and the heavy 'slurry' is pumped to a tank on a hillside high above the Kiln, from which it is run by gravity into filter presses and there drained by means of canvas sheets; most of the water is removed by these processes and the caked kaolin is broken up and thrown on to the heated tiled drying-floor known as the 'pan'. After a day or more on the pan



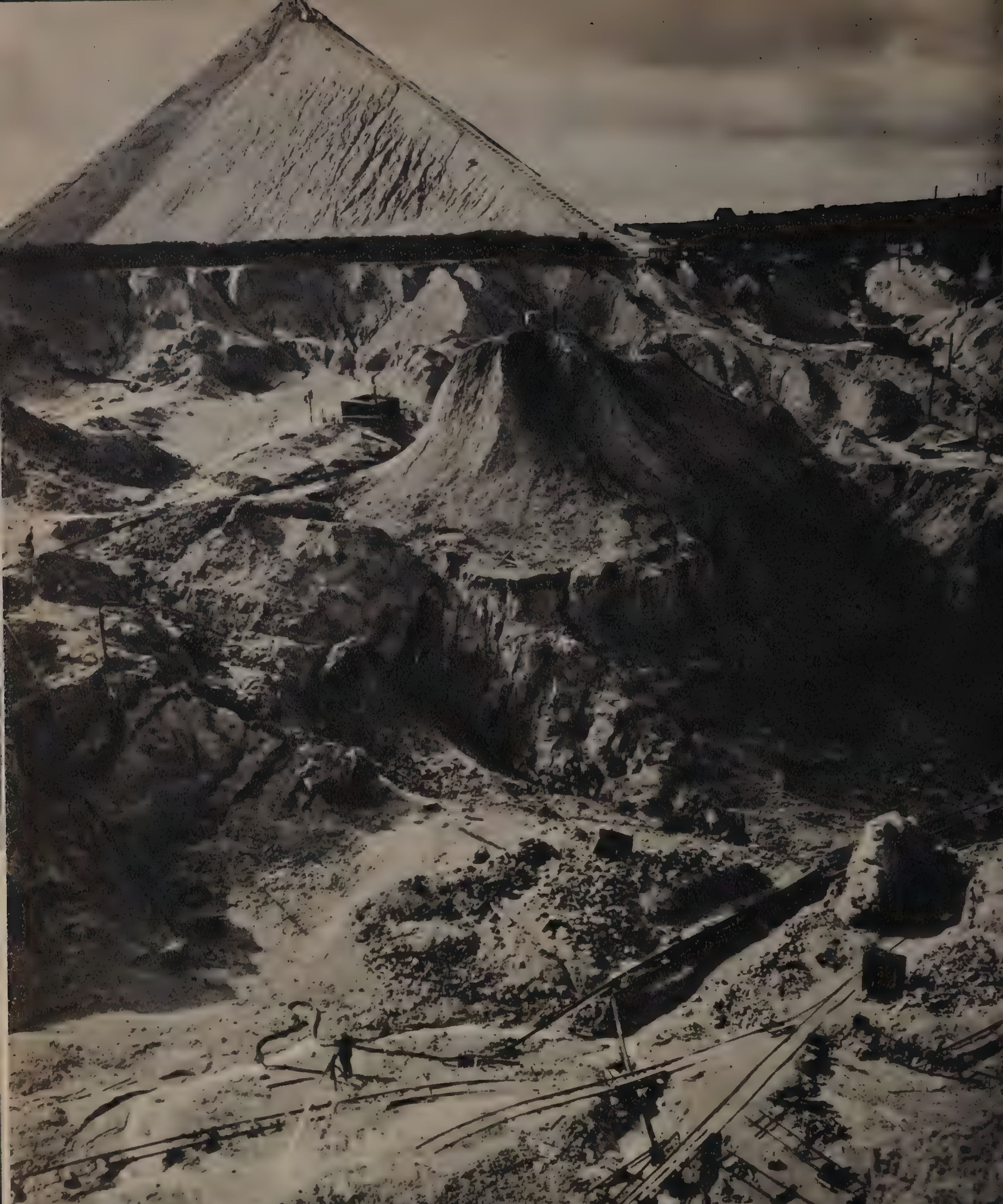
A general view of the Great Hawks Tor Mine, Bodmin Moor. On the right is the quartz sand tip; a mica dam lies at its foot. On the left is the overburden tip, with a disused sand tip behind. The disposal of its enormous quantities of wastes is a major problem in the China Clay industry

the clay is dry and is transferred to the storage 'linhay', with a capacity of over 3000 tons. From this it can be loaded into railway trucks on the adjacent sidings for conveyance to Fowey Jetty, where it is transferred aboard ship.

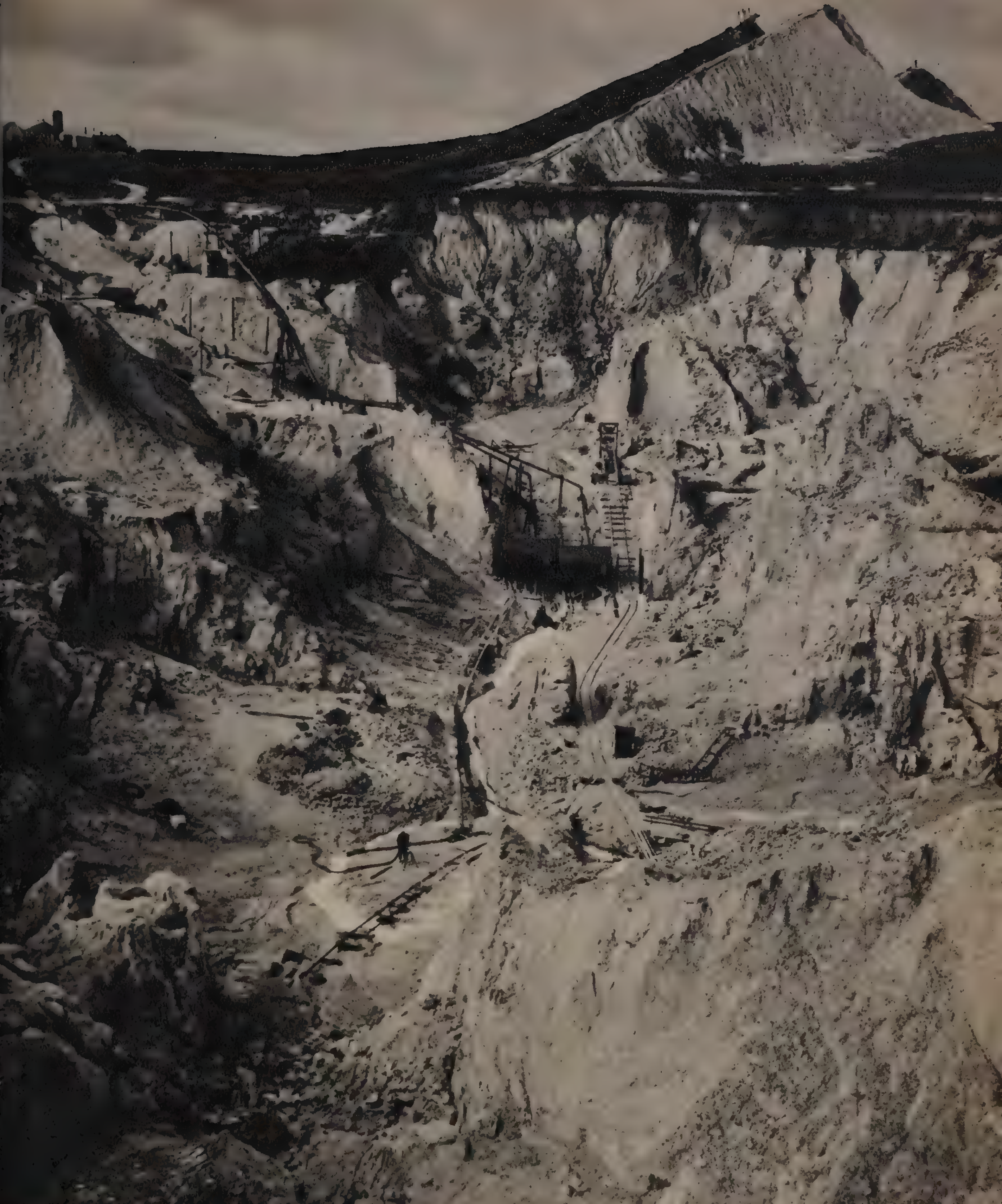
This brief outline necessarily omits any reference to the practical difficulties met with in mining the clay. These are many, starting with the elevation of the pit, which is nearly a thousand feet above sea level, and the climate of Bodmin Moor, where heavy mists and floods can never be discounted. Normally the process of mining is continuous for twenty-four hours a day. This is desirable not only for maximum production but also to maintain the circulation of the wash; thus reducing, in winter, the likelihood of freezing in the pipes. There is also the intrusion of impurities in the clay deposit, which have to be blasted or picked out and removed. Apart from the intrusion of 'foreign' rock, a vein of iron or any other staining deposit running through the workings will discolour and spoil the kaolin if washed out with the rest of the clay.

Kaolin is a hydrated silicate of alumina. It was first mined commercially in 1755 and the production of the English industry has been as high as 869,232 tons in a year. As its popular name China Clay suggests, the first commercial use of kaolin was in the manufacture of pottery; later its employment as a filler and coating for paper greatly increased its use. Today paper-making absorbs about half the total output, pottery a quarter, while the balance goes to a variety of industries, among which may be mentioned rubber, paint, textiles, linoleum, chemicals, medical supplies and cosmetics.

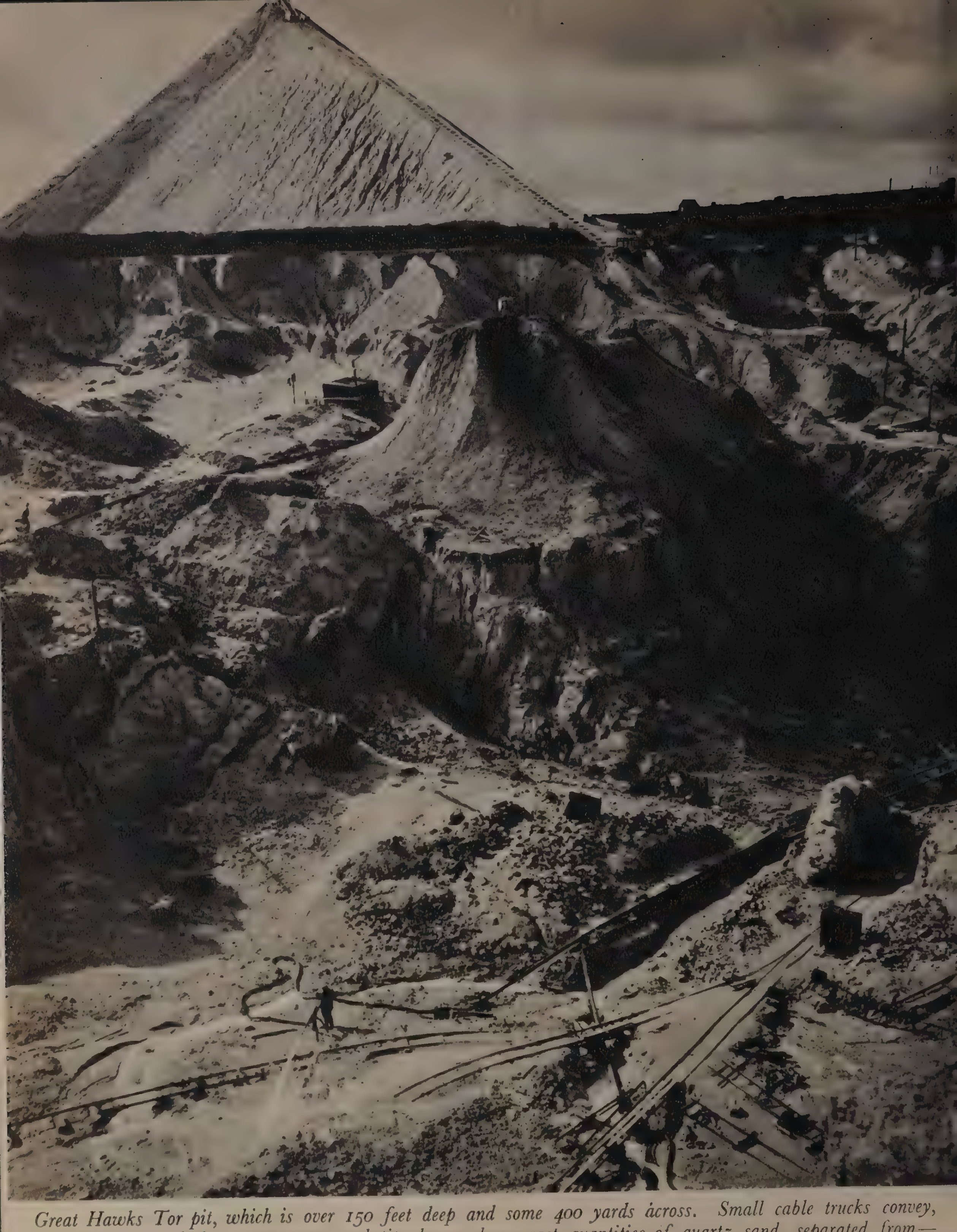
At the present time, with coal supplies restricted, China Clay ranks first in tonnage and value of all raw materials exported from the United Kingdom.



Great Hawks Tor pit, which is over 150 feet deep and some 400 yards across. Small cable trucks convey, to the summit of the 500.000-ton sand tip shown above, vast quantities of quartz sand, separated from—



—the clay by washing. Another form of waste-matter is the topsoil, up to six feet of which must be removed to the overburden tip (see earlier page and, here, in the background) before the clay is exposed



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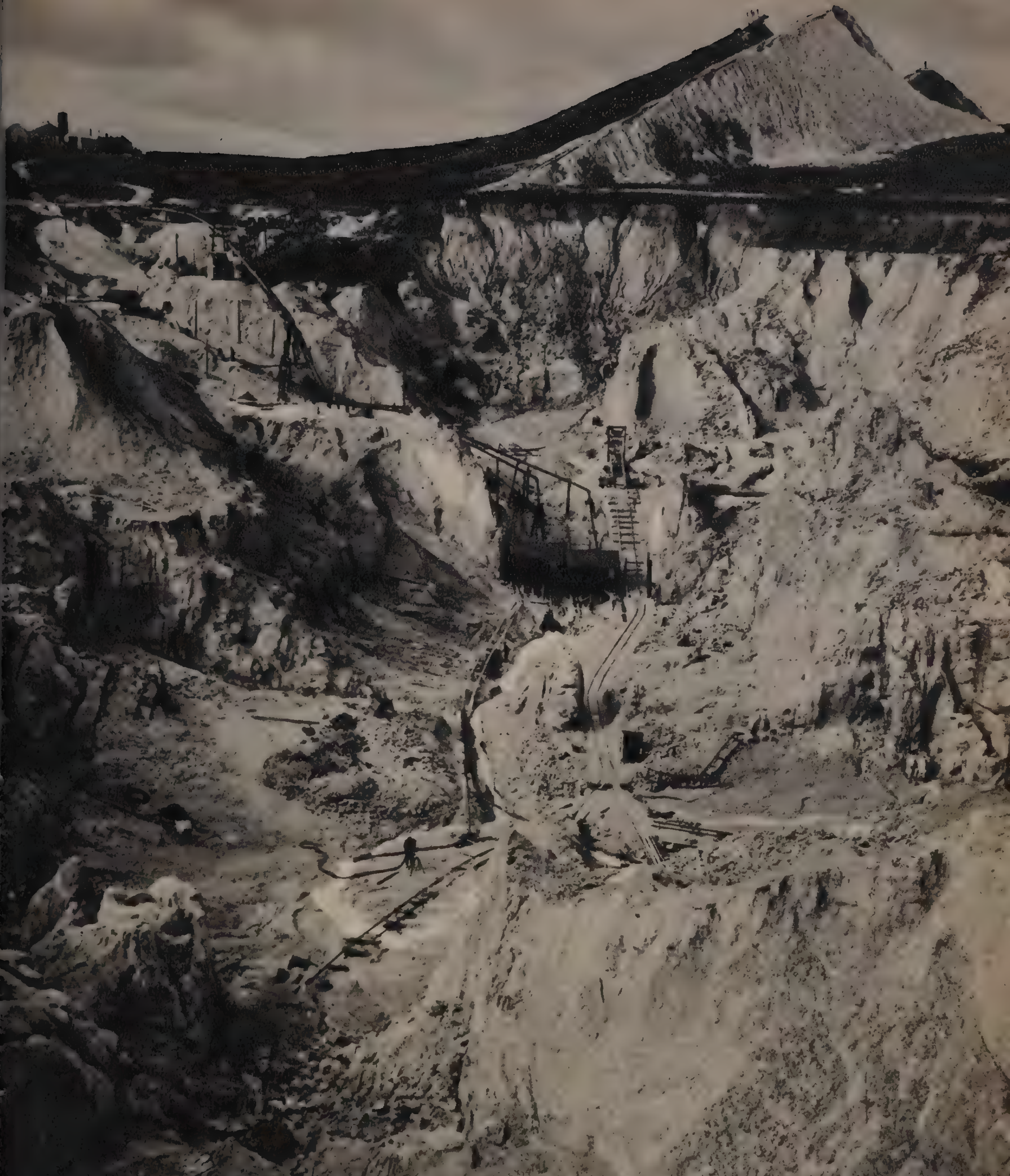

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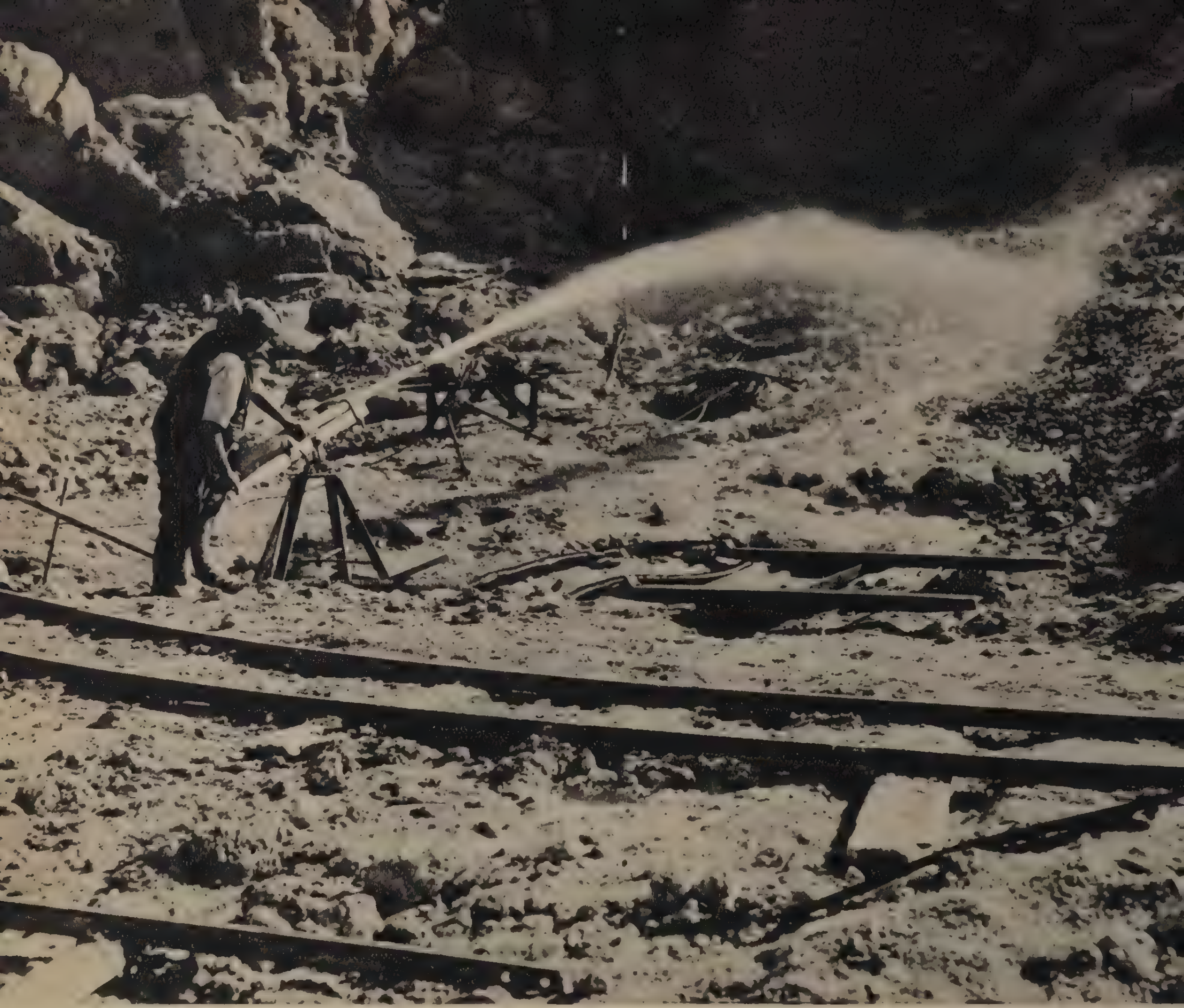
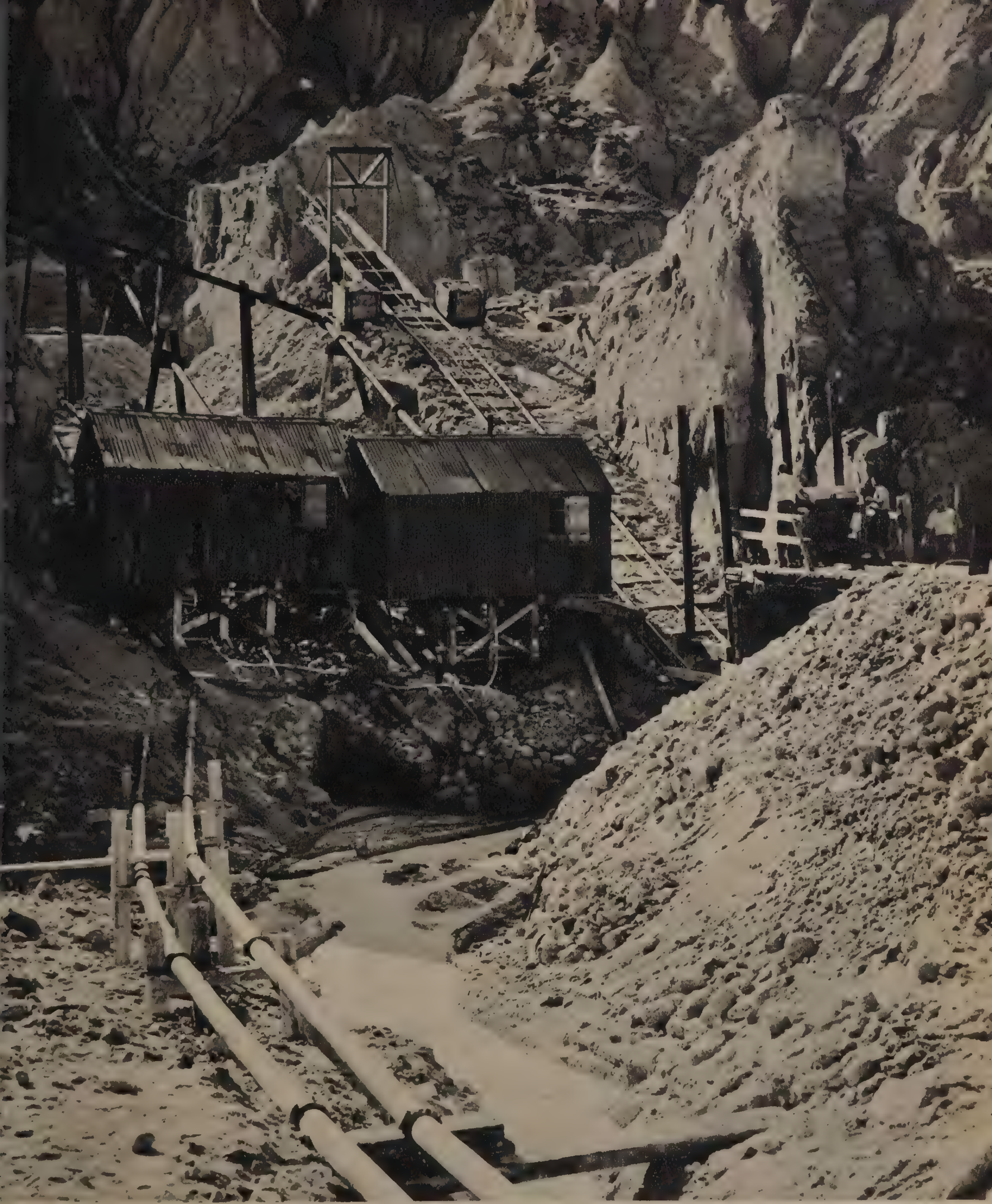
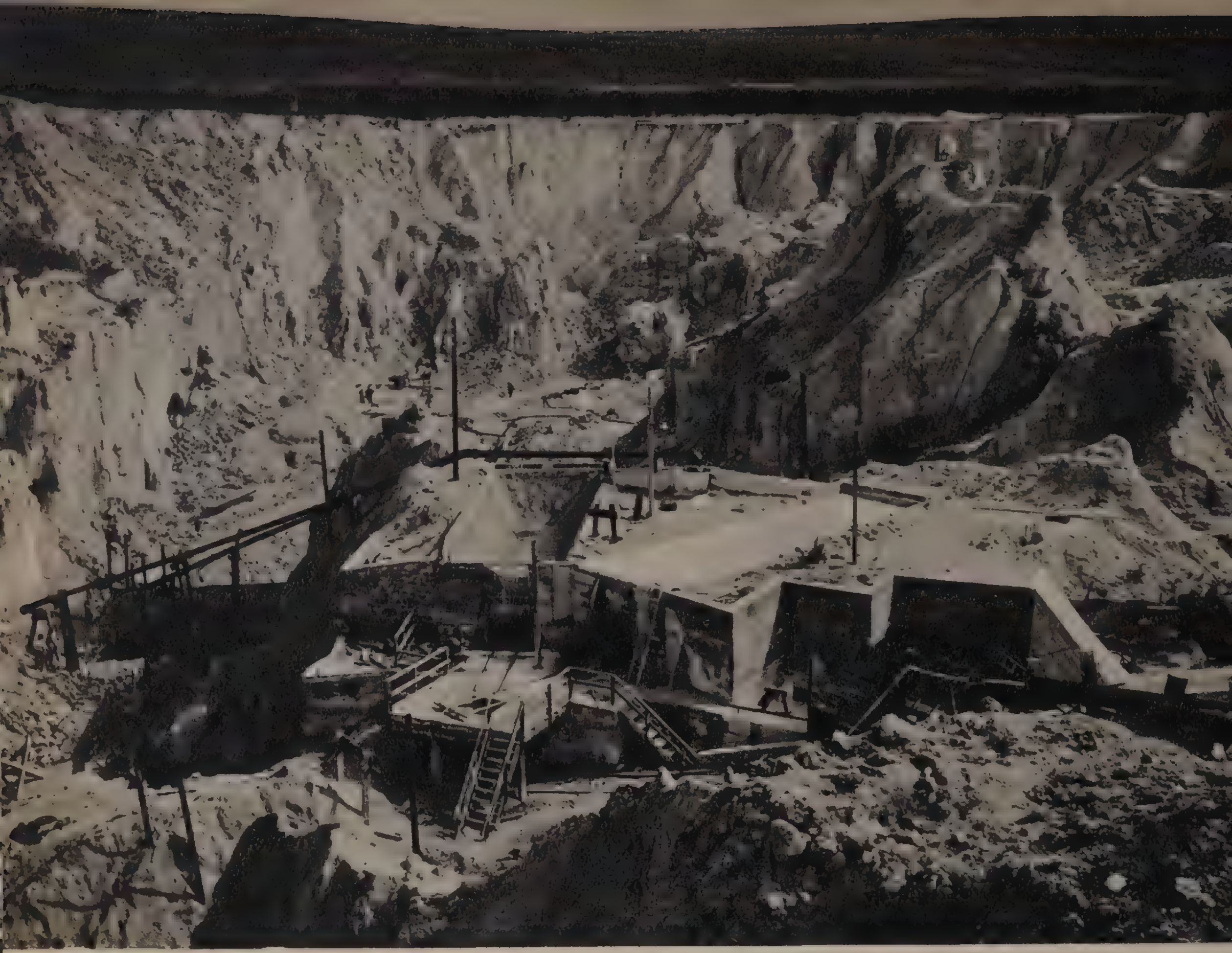


The first step in removing China Clay from Great Hawks Tor pit. The unrefined clay " is ' mined ' by washing it out with water (known as ' wash ') from pressure-hoses. . . . Normally the process of mining is continuous for twenty-four hours a day. This is desirable not only for maximum production but also to maintain the circulation of the wash; thus reducing, in winter, the likelihood of freezing in the pipes." The water contains much waste-matter, in addition to pure clay, and this has to be extracted. The wash runs down into pump houses, whence it is pumped up to sand-boxes; here the heavy quartz sand sinks, and the wash, carrying China Clay (kaolin) and mica, is then pumped to the ' micas ': long shallow channels through which it runs and at the bottom of which the mica is deposited as it settles out

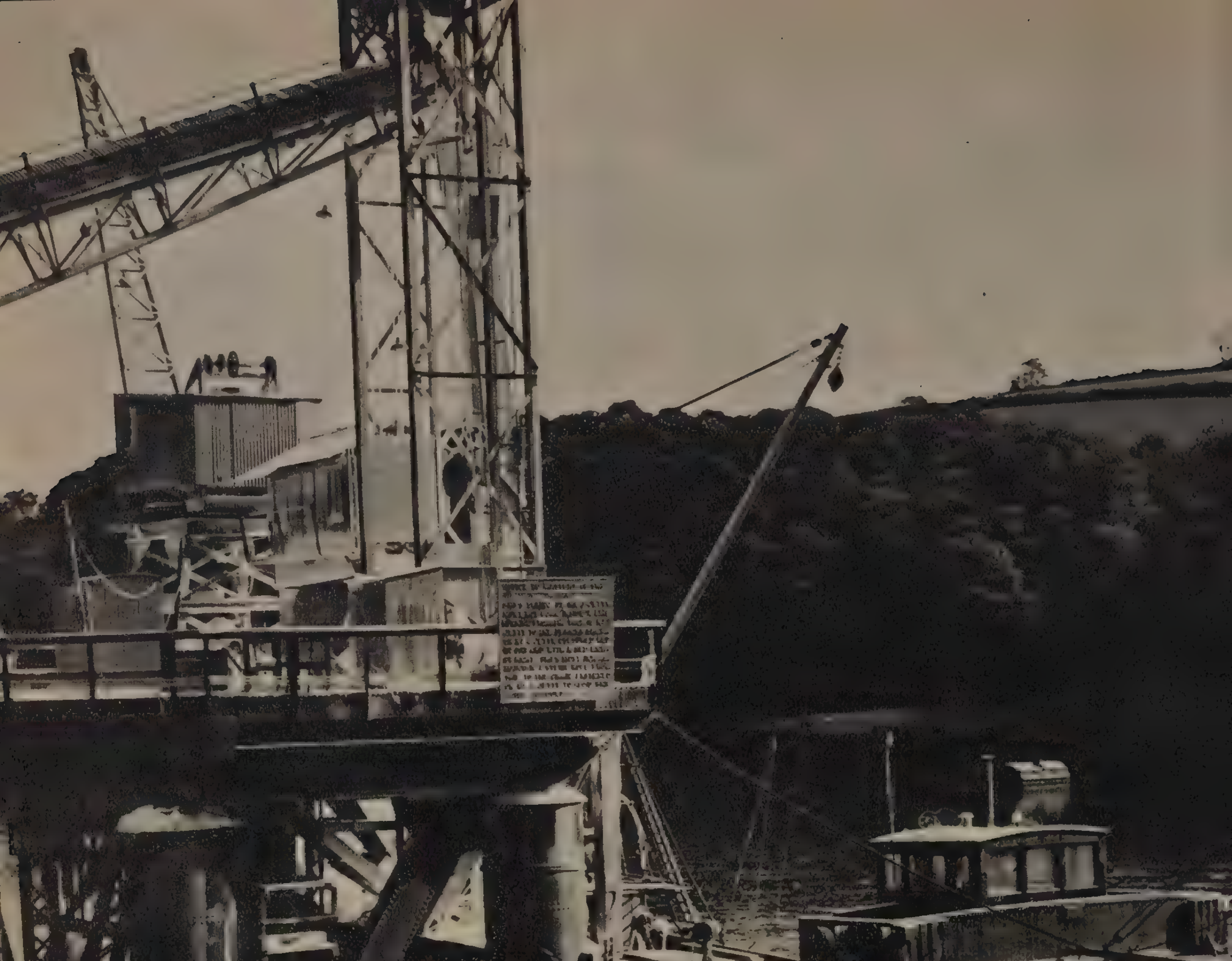


A close-up view of pipe-lines leading to the pressure-hoses, and two sand-pump houses, which are on inclined rails so that they can be hauled up during floods; the pipes above them carry the ' wash ' to the sand-boxes



(Above) *The sand-boxes at Great Hawks Tor pit, with pipes bringing the 'wash' from the sand-pump houses. From the 'micas' the wash, now carrying only a content of pure kaolin, flows into settling tanks, where it is stored.* (Left) *Two settling tanks with a mica dam beyond. In these tanks the clay settles, leaving the upper water clear, and this is decanted for re-use in the pressure-hoses*

From Great Hawks Tor Mine the 'wash' is carried by gravity along eleven miles of pipe-line to the storage tanks at a second section of the works known as the 'Kiln' (right) *and situated in the valley of the Fowey. After undergoing various drying processes, the caked China Clay, or kaolin, is broken up and* (below) *spread out for a day or two on a heated drying-floor called the 'pan'*



All photographs by the Author

The dry China Clay is conveyed by rail to Fowey Jetty, where modern loading devices transfer it to ships. At present, kaolin ranks first in both tonnage and value of all raw materials exported from the United Kingdom

Hiroshima, 1946

by NICOLAS FURSE

The world is still dazzled by the flash of the atomic bomb. What might one think of its significance if one had seen desolated Hiroshima, against its Japanese background, before reconstruction had begun? These are the impressions, viewed in retrospect, of a Sub-Lieutenant, R.N.V.R.

We came up from the Pacific between the islands of Kyushu and Shikoku into the Inland Sea and anchored around midnight among the islands of the Aki Nada, before proceeding into Hiroshima Bay.

It was a peaceful watch; the fine-spun beam of a lighthouse softly brushed the darkness and the riding lights threw quicksilver on the polished water. The night, the islands and the water, each had their own intensity of darkness, distinct and indefinable.

Soon after first light we weighed and steamed up the bay. The sea was peppered with little islands, hilly and steep-to, their tops covered in woods. On the lower slopes, like giant staircases, ran the rice terraces, their soft pale green a pleasant contrast to the dark of the trees. The soil seemed mostly sandstone for the green woods were gashed with yellow scars. Every island had its small rocky cliffs and tiny bays with pebble or sand beaches that shelved steeply into the clear water. And to the north lay the finely powdered peaks of southern Honshu.

It was a sight of extraordinary, almost magical beauty, shattered in an instant by the superstructure of a half-sunk battleship that rose from the water like a drunken pagoda.

We anchored in Kure Ko for twenty-four hours and then proceeded to the west side of the bay to beach cautiously on the paved slipway of the Japanese fleet air arm station at Iwa Kuni.

The town itself straggled and I never really discovered how big it was. I call it a town because it boasted a Mayor and had, as I was later to find to my cost, more than one railway station. But its inhabitants are mostly peasants and fishermen. They had fine faces, with those qualities of age and wisdom, perseverance and obstinacy that belong to peasants the whole world over.

The tiled and gabled houses, sometimes one, sometimes two storeys high, crowded upon the street, their low doorways opening straight on to the roadway. The effect was that of the Tudor town of one's imagination. The streets were full of children running and playing or just sitting and staring; their faces as round and polished as a full moon, with a mop of straight black hair that fell in a fringe.

One day with an interpreter and a messenger we drove down a back alley in search of oysters. The messenger disappeared among the houses and I followed. I found myself in a little yard surrounded by the backs of houses and a jumble of potting-sheds. On a doorstep sat three elderly people drinking and in front of them was an old pony eating from a sack. I looked round for the messenger but he had vanished and in his place were a dozen pairs of eyes staring with undisguised interest. I turned to the pony and rubbed his nose and then walked off a pace or two. As I expected, one by one the children came softly up and with that grace and gentleness so peculiar to children they also stroked the pony. Why is it that in a foreign country the similarities so often strike deeper than the differences?

Our first expedition to Hiroshima began badly and I must confess it was I who arranged it. A small 'bus took us from the ship to a railway station. The Japanese staff looked mildly surprised and I tried to look important. But there was a lack of life about that station, it had all the atmosphere of rarely disturbed peace that one associates with branch lines.

The 'bus had gone. But I caught sight of an ancient telephone and was soon involved in a game of charades with the station-master. By gesticulation I endeavoured to explain our predicament and then pointed to the telephone. After he had had a short conversation he politely handed the earpiece to me. I found myself listening to a Japanese interpretress, speaking I gathered from the police station. Never have I heard any one trying to talk English quite so fast. I told her we were at the wrong station and wanted transport of some kind to get us to the right one, in a hurry. The more convinced I was that she did not understand the louder I explained; and the louder I spoke the faster she talked. But she had the last word for she

A. von Graefe, from "Japan" (Atlantis)

Beppu—alive

broke into Japanese and I rang off. At that moment a commercial truck shot into the yard and the station-master grinned broadly.

It was a terrifying drive to the main station which lay on the other side of the town. The Japanese had been so muddled by first Americans and then Australians, that they no longer knew whether to drive on the right or the left. This particular driver however had no such scruples, he just drove as fast as possible down the crown of the road.

At the station a carriage was tacked on to the Tokio train and we were soon on our way. The railway and the road hug the coast and all along the track the people were hard at work rebuilding. Many were tending their allotments, which cover every available inch of level ground and are unbelievably neat. What I took to be rice was being grown on the flattened crests of the furrows, two rows at a time. I remember seeing two women walking backwards dragging a light wooden plough, while others were flattening the sides of the furrows, the wet earth showing clearly the imprint of their hands. Seaward across the deep blue of the water were a number of square-sailed fishing boats, their white sails and rippling reflections looking most beautiful against the little green islands.

It was a scene of industry and of peace and I went to sleep.

I awoke with a start; somebody was saying, "Look, here's Hiroshima". I looked, and thought, "I've seen all this before", and then cursed my lazy-mindedness.

We grabbed an interpreter and made our way out of the station.

There was an unpleasant smell in that city, not strong but all-pervading, which presented itself to the imagination as a biting acrid mixture of explosion and death. Many of the streets had been cleared and we walked slowly southward from the station. Now and again we passed a pile of bed frames or bicycles, raw with rust and cruelly jagged, or a heap of twisted molten glass, sometimes clear, sometimes thick and veined like jade. But the senseless similarity and immense distance oppressed the mind; where only a black tree, a cracked plinth or a concrete building rose sharply from the monotony of shattered tiles.

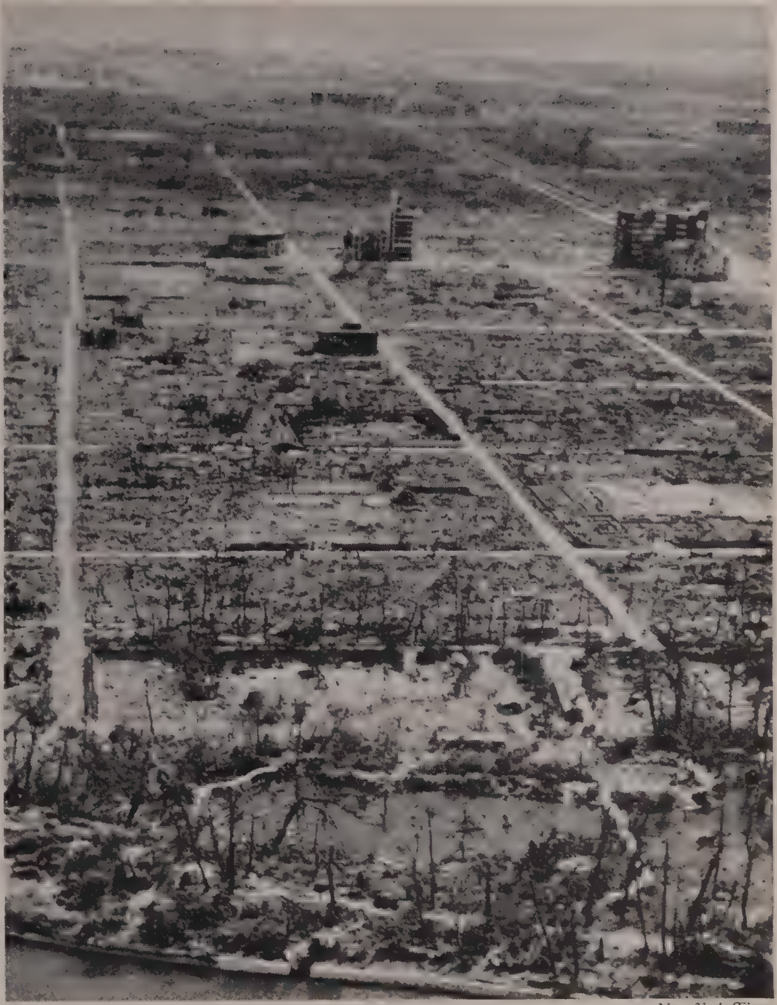
There seemed to be no pattern connecting one isolated object with another. All was singular, solitary and devoid of meaning. The interpreter said little; once, lifting an expressionless arm, he said: "Here was the shopping centre, over there were the banks." But all I could see were a number of safes lying on their backs, gaping idiotically skyward.

We turned into one of the main streets, past a tall concrete building eight or nine storeys high. Its tiers of smoke-blackened windows, like so many burned and sightless eyes, seemed to mock the horizontal waste.

There were some trams running along part of this street, lurching and swaying uncertainly on the ruptured track. They were full of people, dressed mostly in black and many with pads of white gauze tied over their mouths. But people, trams and streets all had a disturbing, unreal quality; the eye perceived but the mind refused to accept them. The trams seemed to appear from nowhere. The terminus was just a crossroads halfway down the street. They came and emptied, filled and disappeared back into the north. But the people, where did they come from? How could they walk so purposefully up this street and down the next, across this turning and round that corner, when there was nothing there? It was a moment before I realized that these people were alive.

The end of the street lifted slightly towards a bridge. Here the cobbles had swollen in blisters or burst open into sores. On the left stood a large building which had been, I believe, a Post Office. Part of one wall was missing and the girders of the dome were bare to the sky. It looked like a diagrammatical model designed to show how it had been built. But nobody cared. Our taciturn interpreter said he thought the bomb had exploded "somewhere above there", and he pointed to the far end of the bridge. But there was no indication, no crater, no exceptional damage, just that same dull grey monotony and those same twisted, truncated trees, frightening and fantastic, like the scribblings of an imbecile.

Always I had a sickening feeling of being imprisoned in a void, a void without significance and without purpose. I well remember gazing with irritation at a thirty-foot brick chimney and wondering why on earth anything so fragile should have been allowed to stand. I had the same feeling of unreasoned anger when glancing over a gigantic pile of tea-cups, because I was unable to see a single broken one. And for the rest of that day I tried to remember whether they had handles or not.


New York Times

Hiroshima—dead

All over the city I could see little figures passing between the banks of debris or stumbling awkwardly across the desolation. Some were methodically picking over the dust of their houses. I felt that they had been doing the same thing day after day for the last six months, always searching for some unbroken object that would remind them of their previous life; and yet intensely afraid lest such a discovery should tear the fabric of forgetfulness and torture the mind with its own memories. Some were just scavenging.

From the hills to the east one spur juts out into the city. Its steep slopes are sprinkled with small trees and on the top stand the crumpled remains of a Shinto shrine. In front was a small sanded forecourt and on the left of the steps leading up to the shrine itself was a large cage, though we never discovered what sacred bird or animal it had housed. Indeed I know nothing of Japanese religion; yet that blasted shrine signified for me more than a heap of rubble and wood and straw. It seemed symbolic of the crushing of Eastern beliefs under the impact of Western science and to bring out the tremendous problem of material progress which faces the world.

Naturally imitative, the Japanese bought the material progress of the West and paid for it at Nagasaki and at Hiroshima. But a country like Japan of an old yet alien, or Africa of a less advanced, civilization cannot successfully acquire from the West just 'material progress'. Because the 'material progress' of any country, that is the product of its scientific and technical invention, is not a distinct entity; it carries certain restrictions and obligations to guard against its misuse, some of which appear in the social framework and political machinery of the country while others are hidden in the attitude of mind and way of thought of its people.

No matter whether material progress be conferred upon or acquired by a country, the result is equally disastrous. Either the 'material', because it is not comprehended by the 'spiritual', remains outside the way of life as with Roman civilization in Britain, or the 'material' crushes and twists the 'spiritual' because it is being carried by a way of life that was not designed for it, as I feel happened to Western civilization in Japan.

The only real and lasting solution lies in spiritual contact. For once spiritual contact is established there can be a free interchange of ideas and a mutual understanding of the respective ways of life. Such understanding and interchange is an absolute necessity before the material products of those ideas can be safely transferred and assimilated.

What I fear is that neither the Japanese nor the Occupation Authorities are fully aware of this. The imposition or acceptance of the social and political machinery of Western democracy, the present process, is bound to fail and failure means war, if mutual understanding and true spiritual contact are not achieved.

Although the sight of that shrine first brought the problem to my mind, it was strangely confirmed and illustrated by a conversation I had with an interpreter in Iwa Kuni some days later. He had left Japan fifteen years before and gone to live in North America. At the end of 1945, like so many of the internees, he had been sent back to Japan. I once asked him what struck him most about his country when he returned. He thought for a moment and then said slowly: "I was amazed to see no sign of progress." He went on to explain that his country was fundamentally agricultural and that the land system, as far as I could understand him, was to this day a rigid, almost feudal system. Industry was owned on the same basis and was entirely in the hands of about seven families, of whom only three really mattered.

He said he was a democrat and that he would like to see Japan governed by a Congress on the American model with the Emperor as a king in the English sense. But though I felt that he was probably honest and despite the fact that he had been in contact with the West for fifteen years, I am quite certain that he knew very little about our way of thought and had no real understanding of it. He, like so many others, was merely anxious to imitate its symbols.

But to return for a moment to the top of that hill. Though I visited it twice, I think, it was the first occasion which has remained as one of my most vivid memories. It was late afternoon. The sun hung like an enormous paper lantern, dull and red and luminous. I remember it sent my mind back to those November afternoons when as a child I trotted behind the pram, hurrying home to tea. The sun sinking over Kensington Palace had the same strange magical quality of that sun dying over Hiroshima.

There in the fading light, grey-blue splashed with red, I could see all across the city. Below were the concrete buildings, their starkness mellowed to a pale yellow, the ruins a dusty smoky blue, the roads just silvery streaks and the rivers black-twisting, dull red where they caught the sun, like stagnant arteries; and, beyond all, the blood-stained mountains.

> All is dust and a mocking dream,
> ' All ' and ' Nothing ' are just the same,
> For nothing is, and the things that seem
> Out of a mindless chaos came.
>
> (*Glycon. 7th Century A.D.*)

That is how I remember Hiroshima.

Walking among the desolation one's mind was shattered, twisted and splintered, beyond the power of reason, beyond even the capacity of memory. Distance and time have brought peace and a certain comprehension. I have found myself sifting one question from another without any direct attempt at finding an answer. Was it so many square miles of devastation? Was it a crime against humanity? Or was it just an accident of war?

I have come to the conclusion that none of those questions touch on what is truly significant. I am convinced that in the fulness of time posterity will decide the moral issue; and I feel that it is valueless to try and solve a problem whose facts must remain, at least for the present, beyond our comprehension. That does not imply an attempt to dismiss the atomic bomb, for once something has been invented, for good or evil, it is a part of our lives; you cannot 'uninvent'. The moment for debate as to its first use has also been irretrievably lost. The bomb has been dropped and surely we shall be judged, not so much on whether we were right to use it, as on the use we made of it once it *had* been dropped.

I do not believe that there is any defence against atomic warfare except faith, the united wish for and belief in peace. The greatest power mankind possesses is the faith of the whole community, and it is a power which has never yet been used. I firmly believe that if Nagasaki and Hiroshima can make us realise the utter evil of war and the power of spiritual unity, there will exist a posterity to weight the action against the result. It is not impossible for man to turn the greatest potentially destructive force into the surest means for his own preservation.

From the shrine on the hill we returned to the railway station. Waiting on the platform we were accosted by a Japanese student. As far as I can remember the conversation went like this.

"Are you navy?"

"Yes." A slight pause.

"Are you Eengleesh Navy?"

"Yes." He then retired, but curiosity was too much for him and he approached us again. In a voice quivering with excitement he asked softly,

"Do you know Disraeli?"

"Yes," we said, rather taken aback.

"Do you know Mr Palmerston, Mr Gladstone, Mr Pitt? Very fine man Mr Pitt."

We mumbled something.

"Do you know a book by Shairlock Homes?" he asked.

"Yes," we replied more confidently.

Thereupon he produced from his leather satchel a copy of *Sherlock Holmes* in Japanese. I scarcely managed to stop myself from telling him that he was opening it at the wrong end. He unscrewed his fountain-pen and began showing us how good he was at mathematics, and how Japanese characters were built up. Somewhat diffidently we asked him if it was all right for him to be scribbling all over the book. "Oh yes," he replied cheerfully, "it's my book."

From the ensuing conversation we gathered that English was a compulsory language in all High Schools and that it was in order to improve his English that he had first approached us. "You see," as he put it, "my master says I speak very idle English." Just before he left us, he said: "I want very much to know, is the American 'twenny' spelt the same as the English 'twenty'?" We replied that it was the same word and he remarked: "American, very ugly and sloppy language".

Soon after, our train came in and we travelled slowly out of the city into the gathering dusk. We had not gone far when the train came to a shattering halt. It rocked and whistled, puffed and jolted, but all to no purpose. We got out, walked along the line and climbed into the cab. By sign-language we discovered that the brakes had jammed. At the end of some three-quarters of an hour they were successfully released to a fanfare on the main whistle and we began to get up speed rapidly.

It was a curious sensation, hurtling along in the darkness which felt so near and so solid that I almost persuaded myself that if I put out my hand I would touch it. Suddenly the semi-circular doors of the furnace shutter would open, flushing the cab with its strange light, giving the stoker just time to throw on another shovelful before they closed and the night returned.

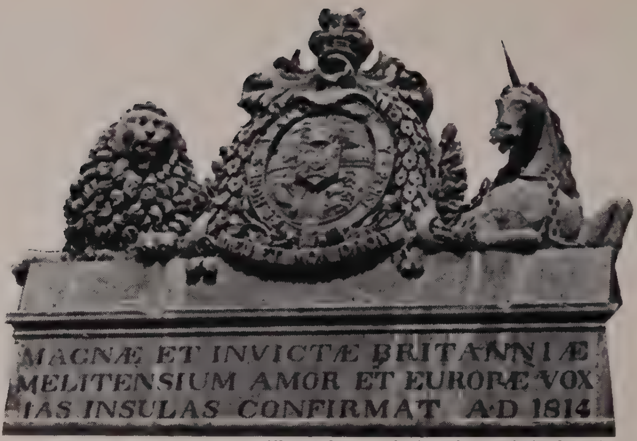
Every now and again the stoker would pull from his breast-pocket a small mirror and hold it up so that when the shutter opened the light of the furnace was reflected upon a pressure gauge. The driver, who sat silent on the left-hand side of the cab, would glance up, extend a hand to adjust a valve and then carry on staring into the night.

It gave me an uncomfortable feeling to watch those two, both quite young, acting so automatically, so efficiently and with such immense concentration, their faces absorbing the blood-red light and seeming to glow, long after the shutter had closed, with an impenetrable half-smile utterly devoid of friendliness or humour.

I realized then (and I hope I still do) just how little I really knew of the country and its people.

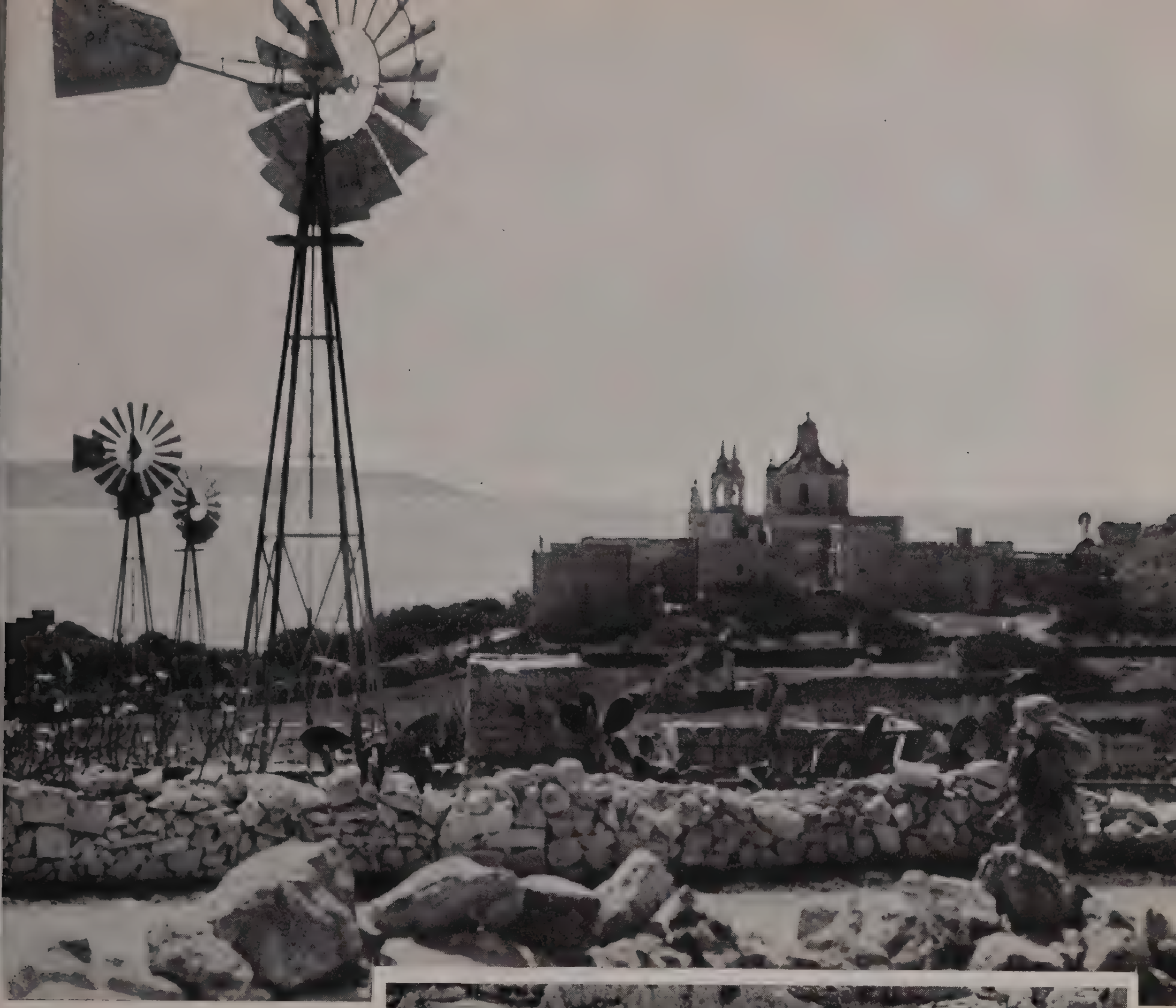
The Malta Background

by PAUL REDMAYNE

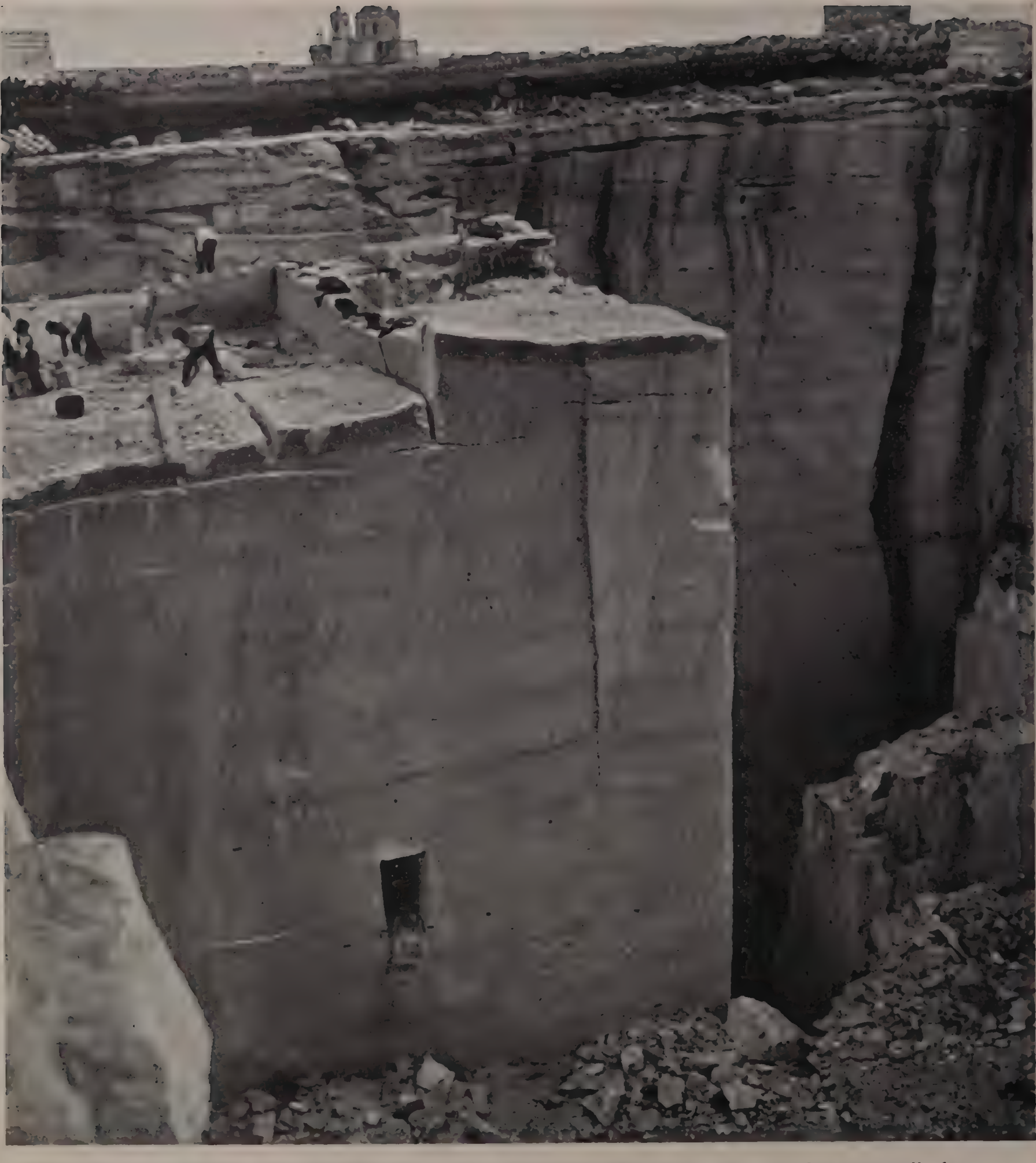

MAGNÆ ET INVICTÆ BRITANNIÆ
MELITENSIUM AMOR ET EUROPÆ VOX
IAS INSULAS CONFIRMAT A·D 1814

All monochrome and colour photographs by the author

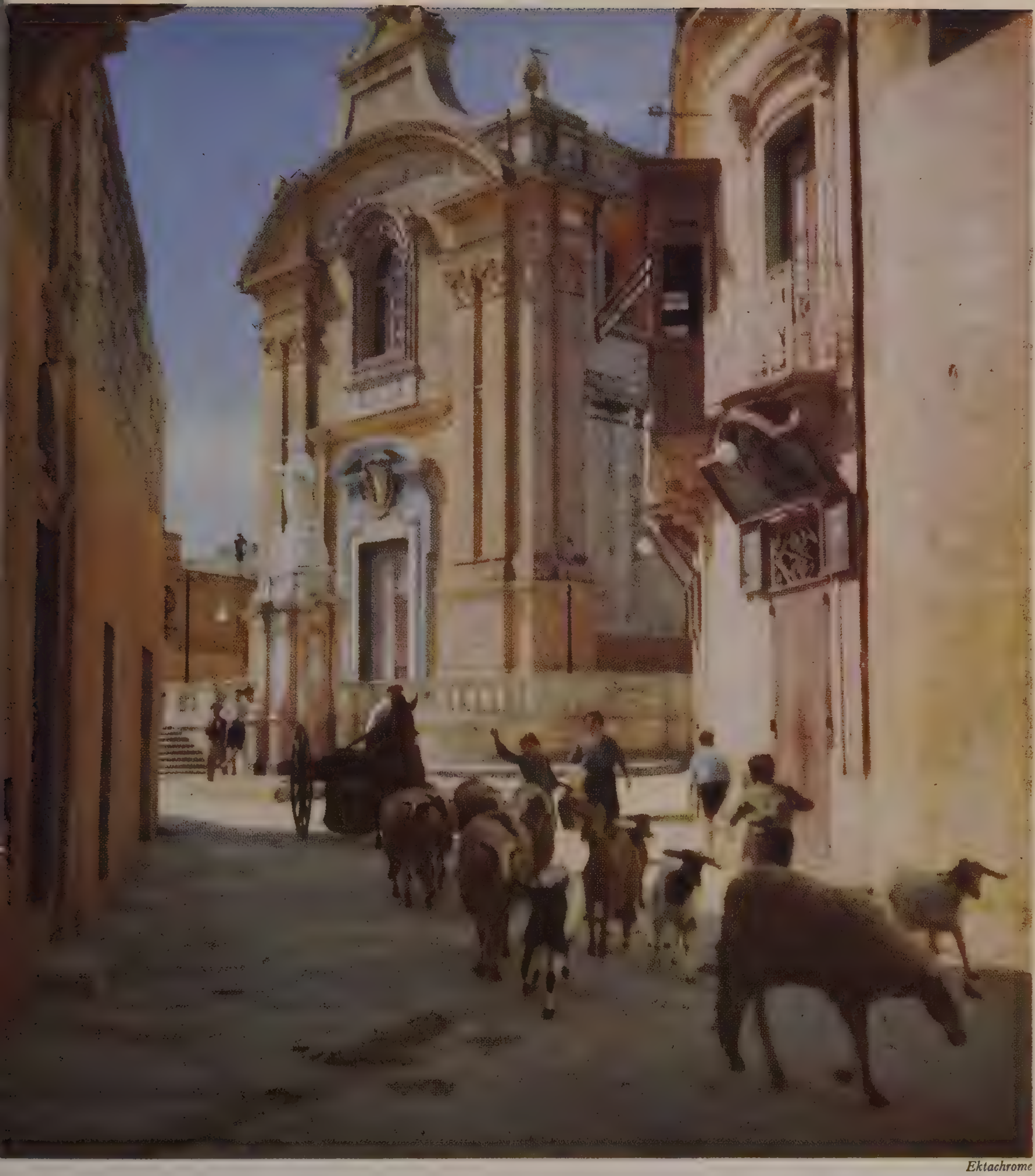
What is the 'Malta Foreground'? All of us remember the George Cross island, honoured thus in 1942 for its gallantry under constant bombing; most of us think of it as a British naval base, which it became during the Napoleonic wars. The seal was set to its capture from the French by the Treaty of Paris in 1814; and to this the inscription over the 'Main Guard' in Valletta (above) *bears witness: "The love of the Maltese people and the voice of Europe confirms these islands to Britain, great and unconquered". The islanders can certainly have had little love for the French, who in 1798 drove out the Knights of St John of Jerusalem, their rulers since 1530 and bringers of wealth from contributing religious institutions all over Europe. Further than that we need not go to distinguish the features that compose Malta's foreground; they are inscribed by history. Behind them lies something else: a background of geography, much of it shared by Malta and its satellite Gozo with many another Mediterranean island*



This 'Malta Background' is made up of various elements—sun and sea, much rock and little soil or water. From them a hard living has been wrung by the fisherman and the peasant cultivator since prehistoric times. Man must supply what nature withholds. (Opposite) *Soil is conserved by stone walls and terracing. Water is brought to the surface and fed to the fields either* (above) *by windmill-pumps in modern style, or* (right) *by the revolutions of a patient ass, turning the traditional waterwheel*



A quarry near Krendi, Malta. The quarry-men are dwarfed by the great depth of the perpendicular walls. Quarries such as this are a familiar sight on the Maltese Islands, where rock is always to be found either exposed or a few inches beneath the red topsoil. The islands consist largely of tertiary limestone, which is readily cut. The islanders, thus compensated for their lack of timber, have developed great skill as masons and admirable stone buildings abound; many of them, both lay and religious, decorated in the flamboyant baroque manner which demands an easily-worked stone and which flourished during the later period of Malta's occupation by the Knights of St John. The number, size and style of these buildings, especially the churches, testifies to the zeal of the Knights as well as to the opulence enjoyed by the islands under their rule



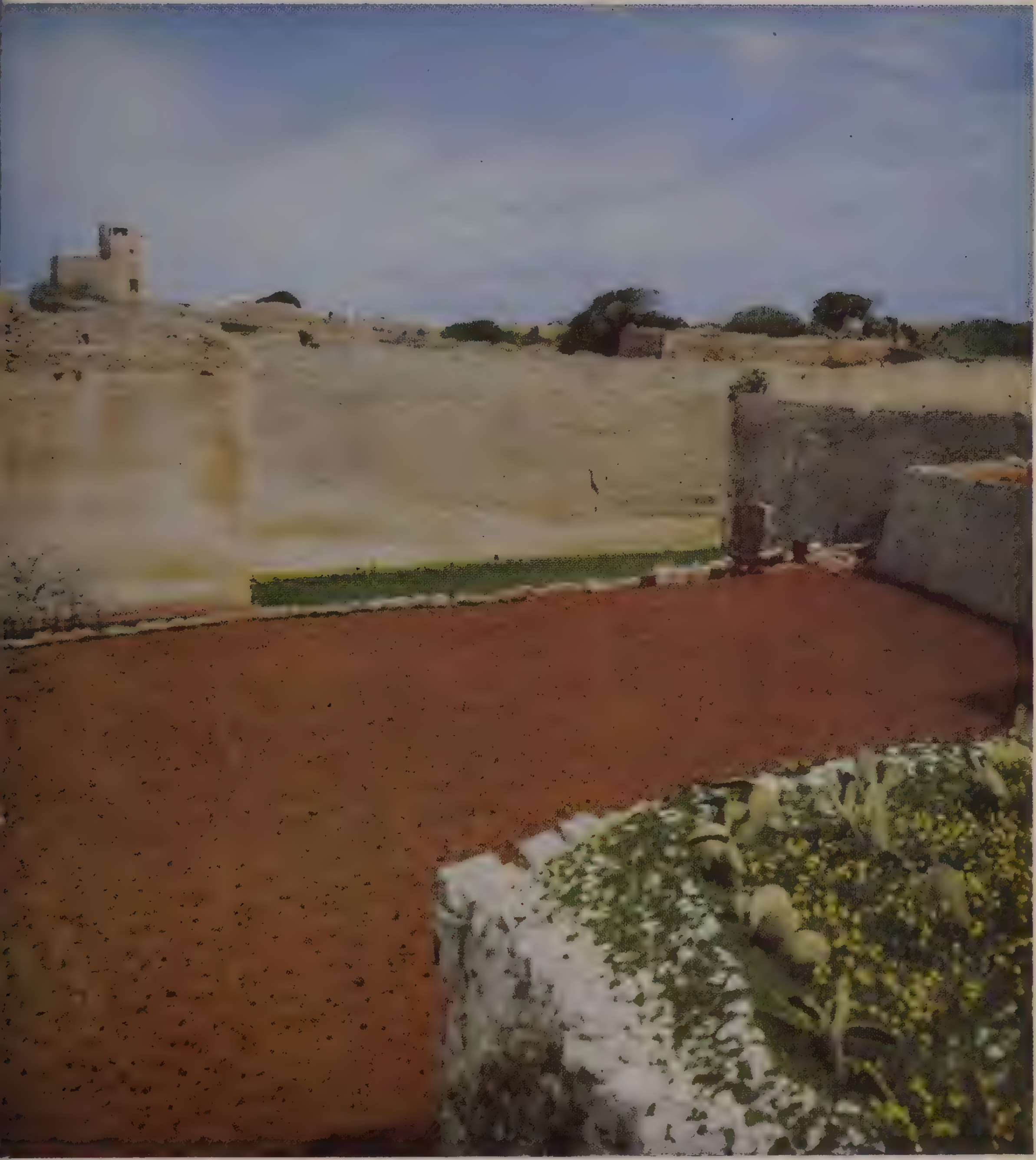
Ektachrome

Every village is dominated by its church, for the Maltese, following the tradition of the Knights, are deeply religious people. Surprisingly large sums are raised and much voluntary labour is donated for the purpose of building new churches and maintaining the old ones. All day long bells seem to be ringing and there is a constant flow of parishioners going to or returning from confession or mass. Religious festivals are attended with a great deal of pageantry and enthusiasm, while religious processions are a frequent occurrence. So is another kind of procession: that of goats, to be seen daily in nearly every Maltese street, as here at Krendi. Owing to the lack of pasturage there are practically no cows on the island; and its inhabitants, therefore, are dependent upon goats, which are driven from door to door and milked to the order of each customer

Ektachrome

Ektachrome

For all its rocky foundations, Malta is far from bleak: the brilliant blue of sea and sky, the white and gold of hewn stone, provide a setting that enhances colour wherever, as in (above) *the Valletta public gardens overlooking the Grand Harbour, human efforts bring it to light. The appearance of a Malta farmhouse* (left) *may not have much to commend it; and the farmer's life is certainly a hard one: an incessant battle against—*



Ektachrome

—drought and erosion, with few draught animals to help him, owing to the scarcity of grazing. So precious is the topsoil that it is sometimes collected to make fields, such as that shown above, in disused stone-quarries. Nevertheless this soil of Malta, though limited in quantity, is rich in phosphates and rewards the industrious farmer well enough. The climate also is favourable to cultivation, so that two or even three crops can be grown in rotation annually. Wheat, barley, maize, clover and tomatoes are extensively grown, in addition to oranges, lemons, grapefruit, figs, apricots, grapes, nectarines, olives and prickly pears; as well as the vegetables usual in temperate and sub-tropical climates. There is even an export of potatoes, onions and cumin seeds

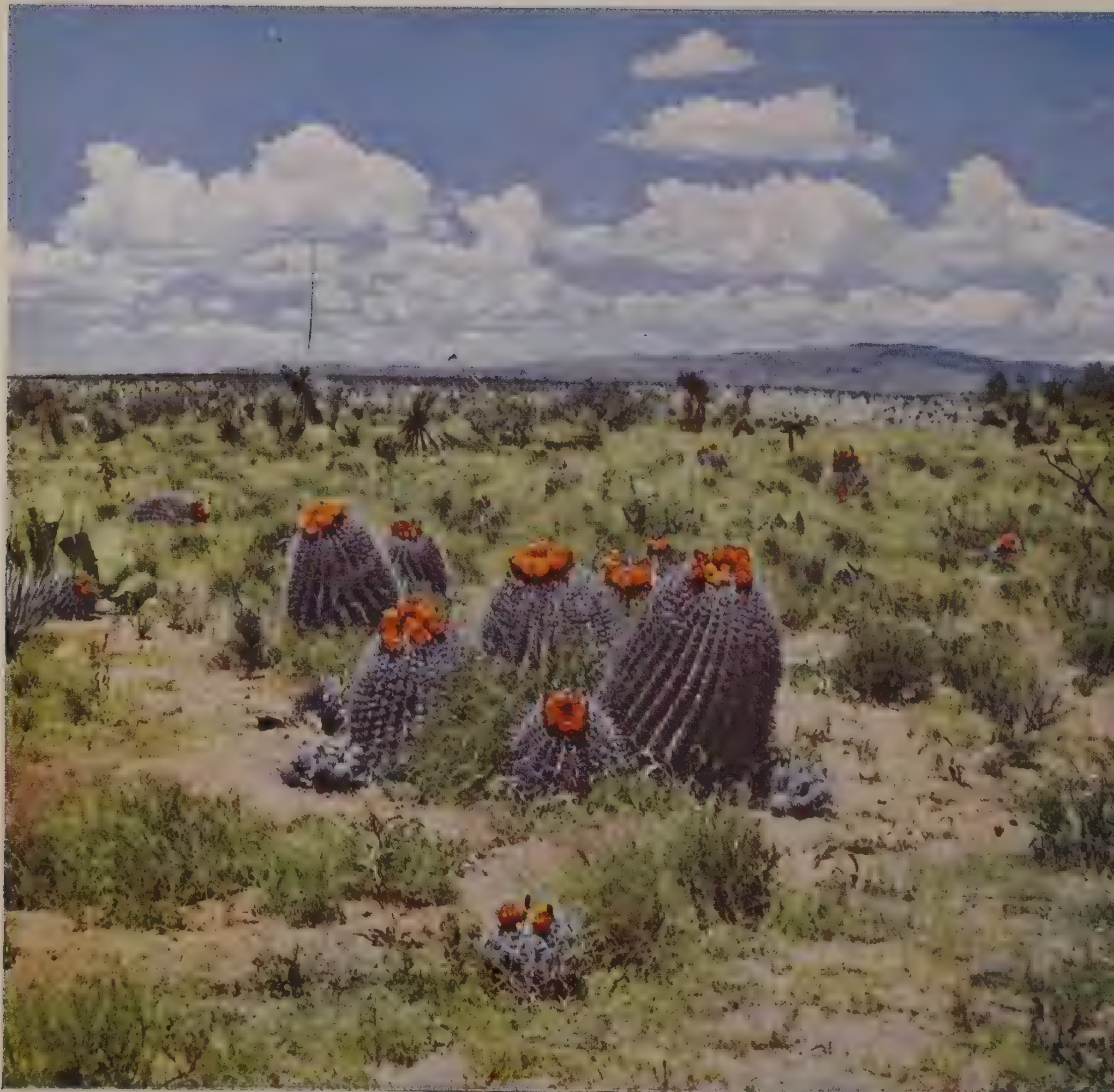
Ektachrome

All that the Maltese farmer can do, however, would not keep 305,000 people alive on two islands totalling 121 square miles in extent. It is to the sea that the Maltese people must turn for a livelihood; the fishermen in their gaily-painted dghaisias *have been doing so since time immemorial, bringing home their regular harvest of tunny, mackerel and 'dolphin'. But of far greater value, as an invisible export to pay for the foodstuffs and much else that has to be imported, is the asset of Malta's strategic position in the Mediterranean, commanding the narrows half-way from Gibraltar to Suez. This affords naval employment to many Maltese both afloat and ashore, besides attracting millions of tons of shipping annually to Malta's excellent natural harbours*

Kodachrome

Terraced fields; fishing boats; and warships in the Grand Harbour; these sum up the three most significant aspects of the 'Malta Background'. To the last, symbolizing Malta's permanent asset of location, she owes most. The Royal Navy, and membership of a world-wide oceanic Commonwealth, are the mainstay of her economy

Kodachrome

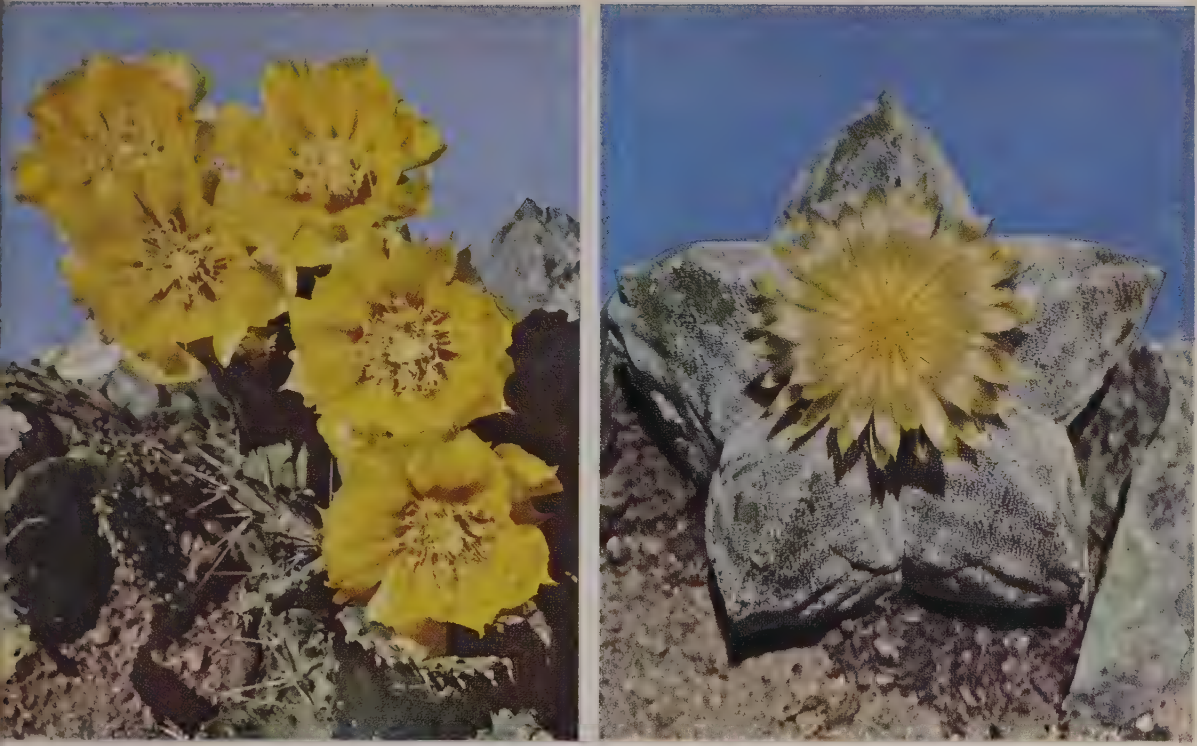


All Kodachromes by Proctor from Three Lions

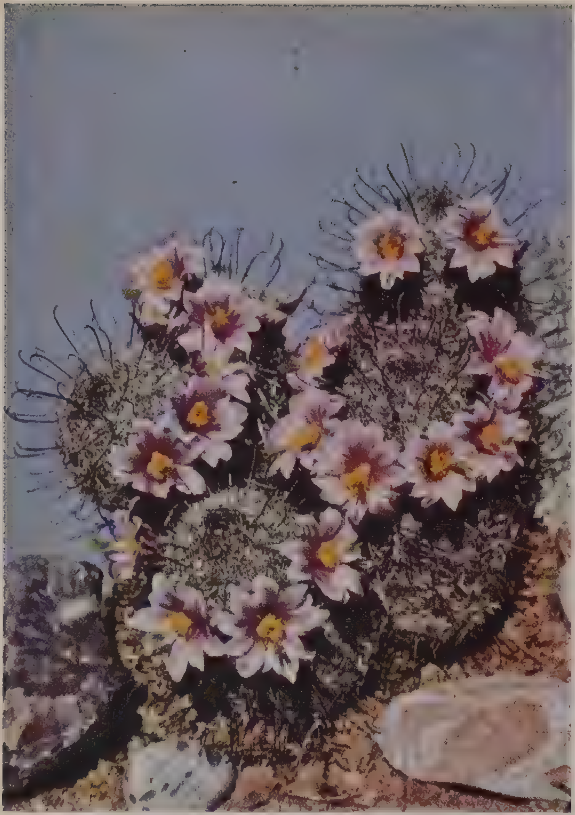
Flowering Cacti

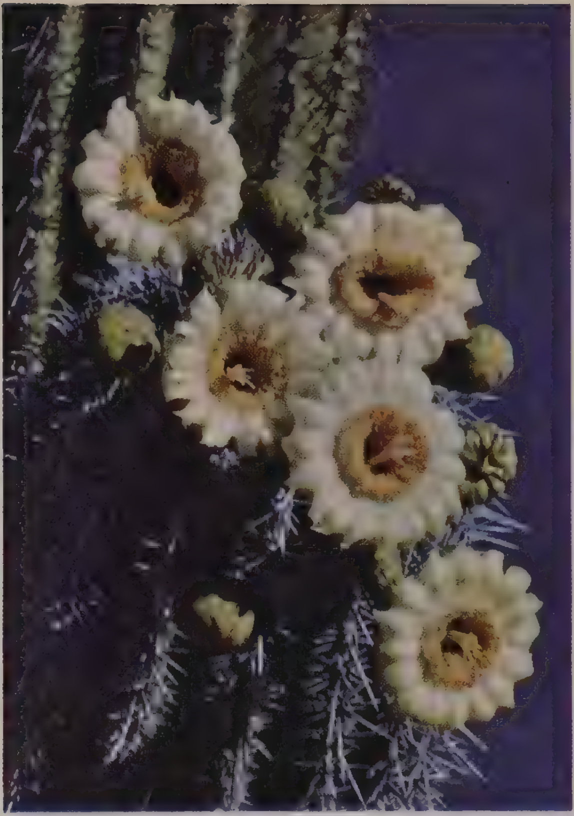
Notes by H. R. FLETCHER

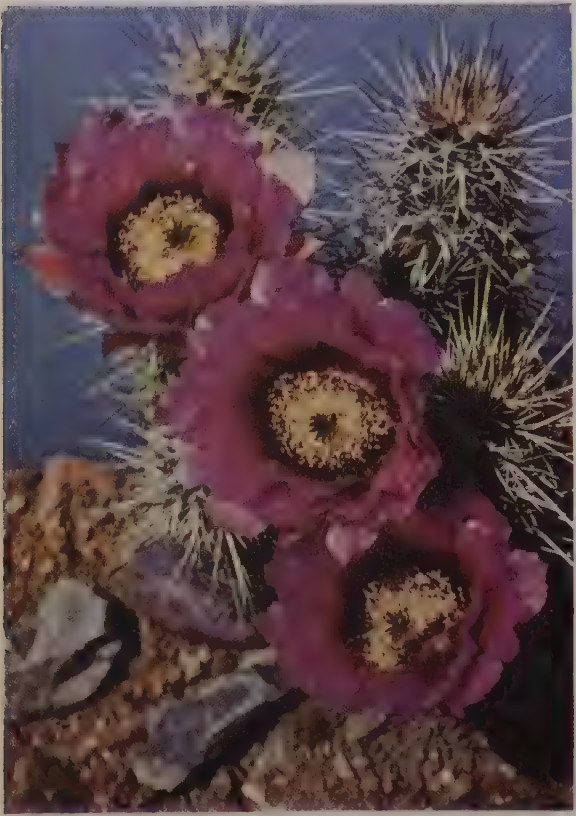
Cacti are essentially plants of arid deserts and mountains of the American continent, Mexico possessing the richest cactus flora. For them life is a struggle against adverse circumstances, especially excessive heat and drought. To conquer dessication these plants have radically changed their form; leaves are reduced to a minimum or lost, while stems and branches are swollen, succulent and often green, and in addition to storing water manufacture food. They have to protect their reservoirs of water against the ravages of animals; hence their armature of stiff, sharp spines, or, alternatively, of poisonous juices. But the spines of Ferrocactus Wislizenii, *the Barrel Cactus, here shown* (above) *growing in Arizona and* (opposite, below) *in detail, do not protect it from thirsty desert travellers who may extract pints of acrid water from its stout stems*



Above, left) *The Dwarf Prickly Pear,* Opuntia delicata, *with flat leaf-like stems and satiny flowers, is a* *ative of Arizona, while* (above, right) *the spineless* Astrophytum myriostigma, *aptly named 'Star Cactus',* *rows wild only in Mexico. Plants with 'stars' of three or four ribs are rare and much prized by collectors*







(Above) *The waxy white flowers of the giant Saguaro Cactus,* Carnegiea gigantea *(commemorating the memory of Andrew Carnegie, philanthropist and patron of science). These centuries-old sentinels of the torrid valleys and mountains of Arizona, south-east California and the States of Sonora and Mexico raise their stately yet sombre columnar stems thirty feet or more*

(Left, above and below) *These two pinkish-purple flowered plants are among the dwarfs of their race. The first,* Mamillaria microcarpa, *dots the deserts of Arizona, Texas and Mexico with two- to three-inch balls of greyish and fiercely hooked spines, which have earned it the name, 'Fishhook'. The lower photograph shows the glorious flowers of* Echinocereus Engelmannii, *which brighten the deserts of California, Arizona, Nevada and Utah in early spring. Its red skin removed, the fruit can be served with cream as dessert, its flavour accounting for the name 'Strawberry Hedgehog'*

Life in Spitsbergen

by FRANK ILLINGWORTH

Mr Illingworth, a specialist in Polar affairs, brings an unusual story from an Arctic land, the mineral wealth of which Norwegians and Russians are amicably exploiting. The Birmingham University Expedition to which he refers received a grant from the Geographical Magazine Trust Fund

My first sight of Spitsbergen was a row of glistening jewels—the mountains of Horn Sound, forty miles away across the blue-green ice-floes that drift around the southern tip of this archipelago. And then, slowly, at the best speed the collier *Askeladden* could make through the ice, the coastline grew wilder, more and yet more fearful and at the same time yet more beautiful until, upon entering Ice Fjord, it presented a beauty such as kept me awake and in silent contemplation for thirty-eight hours. This was no ordinary beauty. Like a high-pitched note, it was so intense that it hurt the senses. For the colours of the Spitsbergen fjords are those of a fairy's wings, and in some lights those of the rainbow—clearly defined each from the other, with an ethereal loveliness beyond description.

We passed through three ice-belts before entering Advent Bay, on Ice Fjord, and then at once the beauty left us. Coal dust lay on the scattered ice-pans, and rose in a cloud above the bunkers. From the valley came the constant rumble of coal tubs swaying along the overhead cableway linking the mines and the colliers. The coal they carry is of primary importance to Norwegian economy; for Britain and Poland no longer provide Norway's needs in coal, and thus the Norwegians have not spared themselves in rebuilding Spitsbergen's mining facilities and the shipping that serves them. In this they have accomplished a near-miracle. For the Germans fired the mines, blew up every building and destroyed all machinery with such thoroughness that every nut and bolt and length of wood and nail, and the men necessary to the reconstruction of a community complete with offices, hospital, canteens, married quarters and overhead ropeway had to be shipped through the ice-floes from Norway, more than 1500 miles to the south.

Today, four Norwegian mines are in operation in Spitsbergen, one each at Svea and Kings Bay and two at Sverdup, which is three kilometres from the loading wharf at Longyear, on Ice Fjord. Flanking this last Norwegian settlement are three Soviet mines, none of which is yet in full production, as far as is known.

The Norwegian mines are served by a fleet of sixteen colliers ranging from 1800 to 7000 tons. Engaged in normal traffic during the winter, in spring they head due north through the ice-fields to load the coal piled up during the bitter Spitsbergen winter.

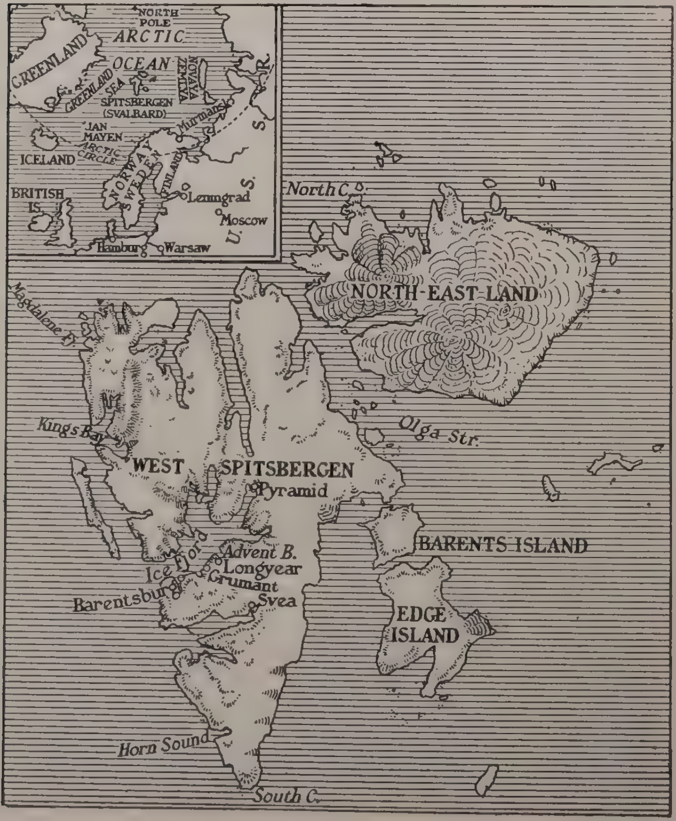
Long in dispute between the northern countries, Spitsbergen was awarded to Norway under the Treaty of Paris in 1920, whereupon the Norwegians named this polar archipelago Svalbard. Today the islands are administered by a Norwegian Governor, Haakon Balstad. A nuggety, heavy-jowled man, he is judge, lawyer, policeman, tax collector, with power over both the Norwegian and Russian settlements. But I very soon learned that the real power is vested in the mine managers, Russian and Norwegian. None may land at the settlements without the permission of the mining companies; the islands are 'closed territory', for every mouthful of food and every nail and plank of wood for the settlements has to be carried through the ice-floes from Norway or Arctic Russia, and the mining companies will not support 'passengers'.

The ice 'closes in' in November, when the silence of winter settles on these settlements barely 850 miles from the North Pole. The temperature drops as the darkness increases, until, in January, the thermometer outside the double doors of the Longyear bachelors' quarters confirms that the cold is truly polar. But work in the mines continues.

"The mining machinery is as modern as you can get," the Mines Superintendent at Longyear told me, "and we reckon to cut four tons per shift per man—summer and winter, which is a very high average." Spitsbergen coal, lying in thick seams through the mountains, is easily accessible, and one British company, two Swedish and one Dutch company operated there before the Norwegians looked to these islands for half a million tons of bunker-coal annually. Members of the Birmingham University Expedition to Spitsbergen last summer came upon the dilapidated remains of the one-time British outpost; likewise the difficulties of maintaining polar settlements forced the Dutch, French and Swedes to abandon their polar mines. Yet the Norwegians not only rebuilt their totally devastated far northern settlements within eight months of the war's end, but stepped up their coal output by one-third, that is, to 750,000 tons annually.

Coal production is to be increased yet further this coming summer, which entails enlarging the settlements. There were forty mining recruits on the collier that carried me to Spitsbergen last autumn, the last of several such batches during the summer. Attracted by a wage of £80 a month all-found, they had signed-on with the Store Norsk Spitsbergen Kulkompani for a twelve-month. On shore, builders, attracted by equally high wages, were working at top speed to complete the new workers' canteen, married quarters and workers' barracks before winter set in. Next March, with the return of the sun, building will start again and the colliers that nose through the ice-floes next June will carry more miners in exchange for the coal supplies piled up during the long, cold winter.

The Store Norsk Spitsbergen Kulkompani and the Kings Bay Kompani look after their 2000 workers with an all-embracing benevolence, providing housing, doctor, hospital, schooling for the children, fuel and food.



A. J. Thornton

I stayed at the bachelors' quarters. On my arrival at this oblong building I was taken to a cloakroom complete with hot and cold water and towel-rail. Tastefully furnished in red leather, the lounge reminded me of a London clubroom; over the clatter of voices in the sitting room came the click of billiard balls on the full-sized table. In the dining hall some thirty of us sat down to three-course-meals of a quality more varied than is normal in Britain today. Smart waitresses tended to our wants in meats, and sweets which included canned peaches.

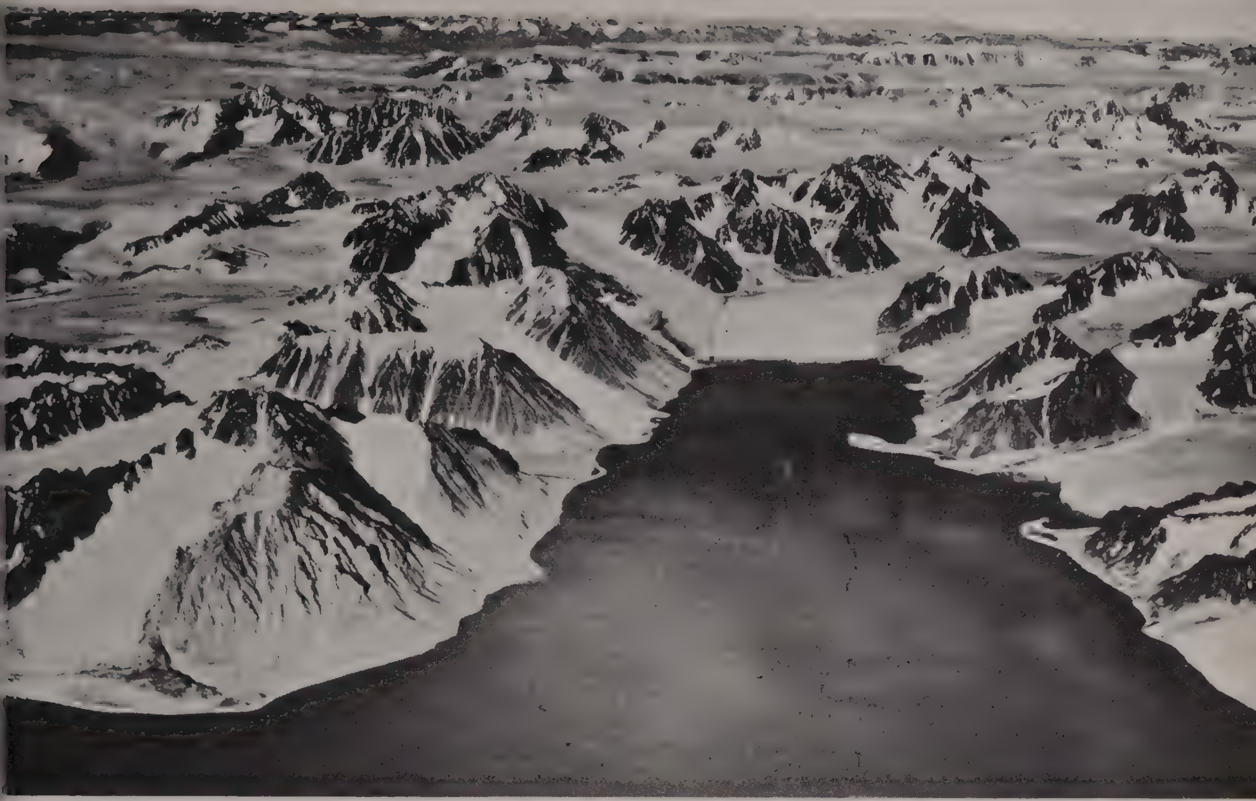
Two hundred yards across the rocky, sodden ground, the newly-built hospital stood with its back to the married quarters, a group of wooden buildings, each divided into four self-contained flats, well furnished with polished birch and leather, served by central heating and electric light.

Here I met Mine-Superintendent Haakon Stuedal, and his wife, Pasan; and here we sat at ease through the night until seven in the morning, talking and drinking, listening to Tchaikovsky on the gramophone, speaking of the Russians along the coast, of the polar bear shot by the cook at the radio station, how the Governor's jeep fell through the ice when visiting the first collier last spring, how time is of no consequence when the summer sun shines day and night and the winter night lasts four months.

The 900 population of Longyearbyen—the group name for Longyear and the mines at Sverdup—includes some eighty women, cooks and waitresses at the canteens and the wives of mine foremen, engineers and administrative staff. The housewife in Spitsbergen escapes the trials common to women in more southerly climes.

"There's no queueing up here!" Mrs Stuedal said with a laugh. "Once a week I send a list of the things I want to the Kulkompani's store, and my provisions are delivered by jeep, or sledge. There's no rationing of food, fuel, electricity or cigarettes."

Only milk and vegetables are in short supply; vegetables because it is impossible to grow anything in Spitsbergen; and milk because the climate does not favour the seven cows at the byre maintained by the Kulkompani, and to import more



All photographs from the autho

(Above) *Magdalene Fjord, West Spitsbergen, the starting point for several polar expeditions. This aerial photograph shows the wild nature of the north-west coast, which is largely untrodden.* (Below) *Sverdup, near Longyear. One of the Norwegian mines can be seen (centre) above the hutments and beneath the rock outcrops*

(Above) *Norwegians at the entrance of their Sverdup mine, reached from below by a cable-operated platform. The men, who earn up to £80 a month each, live in barracks provided by the Store Norsk Spitsbergen Kulkompani.* (Left) *the new canteen and barracks completed last September beneath the mine. Every plank of wood, nail and implement was carried through ice-floes from Norway, as were the builders and all necessary provisions*

(Left) *The Norwegian Governor of Spitsbergen, Haakon Balstad, who lives in a comfortable flat in the radio station at Longyear, overlooking Ice Fjord. With him is his wife, Lif, and their son, Stein. Periodically, Governor Balstad tours both the Norwegian and Russian settlements, in summer by pinnace and in winter by dog-team. His duties combine those of judge, lawyer, policeman, tax-collector and social worker, and officially he has power over all the settlements; but the real power lies in the hands of the mine managers, Norwegian and Russian*

(Right) *The arrival of the first ship at Longyear last May, bringing in a team of huskies, one of which is seen here being lowered overboard onto the ice. Cut off by sea-ice from November to May (and until June or even July in the case of Svea, because the spit of land across the entrance of the fjord prevents the ice from running out) the miners always rush along to the ship to see new faces and to watch the first mail and vegetables being put over the side after a six-month interval*

(Above) *Soviet workers with one of the bulldozers used at Grumant to clear rubble for new buildings, most of which are constructed of coal-ash and cement bricks made locally. The men are given good pay, accommodation and food.* (Below) *A Russian studies mine-output reports on the notice-board outside the office at Grumant*

ДОСКА ПОЧЕТА
ТРУД в С.С.С.Р. есть дело ЧЕСТИ, дело ДОБЛЕСТИ и ГЕРОЙСТВ
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Three of the eighty-odd women at Grumant; they refused to be photographed in the poor-quality clothes normally worn. On the left is the wife of Director Alexei Babad; her companions work in canteens, as do most of the women in the Soviet settlements of Grumant, Barentsburg and Pyramid

cattle would multiply the problems of feeding them, Spitsbergen being, for practical purposes, bare of grazing. Indeed, the only fresh produce between the last supply ship of October-November and the first in May-July is that procured by hunters, mainly the flesh of seal, with an occasional polar bear for variation.

Yet of the seasons, winter is generally the more popular in Spitsbergen. In summer, the little auks swirl overhead in crying myriads, the tundra is bright with yellow and blue polar poppies, and the night is but a memory. But in winter—in winter these islands display a fascination that has caused many a miner who visited them for a year to spend his life among their *fjells*. Such must have been the emotions of the trapper who refused to leave when Allied forces evacuated the islands: one man, he stayed on, all alone in this polar land.

The two main problems in Spitsbergen are the provision of water and the control of liquor consumption. Such is the shortage of water that the pastor at Longyearbyen received a notice from Oslo last summer instructing him to be economical in its use when baptizing, and the Governor was refused permission to install a flush-toilet in his flat. Haakon Stuedal explained why in one sentence: "Water mains are useless up here—the earth's frozen, except for the top few inches in summer." Thus, most of the water consumed is carted across the tundra by jeep or sledge. The household and mine boilers in Longyear alone consume eighty tons of ice daily.

The second problem, liquor, is no less marked. Brandy and *snappes* are, officially, rationed to one bottle per man per month. But both can be had in almost any quantity, either on the polar black market at prices up to £22 a bottle, or by subterfuge at the normal price of 27 shillings; and if the average man drinks no more than he would in his home-town, there is a hard core of miners that, by their actions, might have stepped from the pages of a Jack London novel on the Klondyke days.

My first night in Spitsbergen ended in oblivion—for myself. Subsequently one of my four companions explained: "When you in England ask a friend out you say, 'When shall we meet?' Here we say, 'When shall we get drunk?' " Thus, when we had consumed a bottle of brandy and another of *Grand Marnier* there was produced a bottle of white liquid which the Mine Manager's secretary called "Ninety-Six Per Cent". In southerly lands "Ninety-Six Per Cent" is used exclusively for cauterizing the skin in hospitals: in Spitsbergen one flavours it with *crème de menthe* or anything else available and pours it down one's throat.

"In summer we drink to the midnight sun," the secretary said, "and in winter—in winter there is no sun, so we just drink!" This was demonstrated to me to the full extent during my first three nights in Spitsbergen, after which I retreated in confusion towards less robust citizens.

Efforts are being made to develop social welfare in Spitsbergen. The new workers' canteen (built to replace that which collapsed last summer when the hot water from the washing-up vats melted the earth and undermined the foundations) contains a stage, projector-room, library and reading-room. A football ground was marked out on a glacier last spring. Whist and bridge groups have been formed, and to encourage their growth the Governor invites the winners of the weekly drives to his flat for a quiet game. But these endeavours have not proved entirely successful. The miner is too often a victim of what he calls "Svalbard fever", a lassitude that causes him to lie on his bunk almost in a mental stupor, from which he stirs only to work, or to join the poker schools in which 'pots' of £400 are not uncommon.

Today, the Soviet Government emphasizes that the defence of Spitsbergen should be a joint Russian-Norwegian concern, the islands being an outpost to Murmansk. In their turn, the Norwegians emphasize that relations with the local Russians could not be better. They display a certain distrust in the Soviets' ultimate aim in these polar islands, but time and again the Norwegians went out of their way to emphasize the goodwill existing between not only the Russian and Norwegian mining administrations but between the two groups of miners.

Remarkable headway is being made in reconstruction at the Soviet's three settlements. Of these, only the newly formed community at Pyramid escaped destruction during the war; Barentsburg, near the mouth of Ice Fjord, and Grumant, a few miles down the coast from Longyearbyen, was 'scorched' by the Russians and then utterly destroyed by the Germans. The 400,000-ton coal dump they fired at Grumant is still burning. You breathe in wisps of smoke on the six-mile train ride to the mines; this narrow-gauge electric railway was rebuilt during the depths of the first polar winter after the war. The pier at Grumant is constantly threatened by ice, and Soviet construction engineers began building new coaling facilities a few miles down the coast last spring, in a bay protected by a headland from the main ice-floes; it is planned to lay an electrified line between these new installations and Grumant.

In the meantime, all three of the Soviet settlements are being extended. Very little is known about conditions in Barentsburg, where before the war there were nearly 2000 Russian miners, and at Pyramid; it cannot even be said for certain that the mines here are in operation. But Grumant, within easy reach of Longyearbyen, has no secrets.

The Director of this Soviet outpost, Alexei Babad, is obviously proud of what he calls his "city". The newly reconstructed houses are well-built and comfortable. Last spring a brick-works was constructed, and the bricks, made from ashes from the burning coal dump and cement, in the proportions 85 and 15 per cent, are proving adequate in heavy construction work. Production sheets pinned up outside Babad's office window stress the need for more bricks. Similar lists are pinned on notice-boards in the cinema, in the workers' dining-hall next door, in every workshop, on the railway-halt between the huge photographs of Soviet leaders, and in the electricity plant, now rebuilt and providing sufficient current to power the mines when coal-production commences.

The names of workers with the week's top production figures are put up, and high wages are offered as an added incentive to work. A good construction worker earns up to 2000 roubles a month in Grumant, which will be the approximate ceiling for the miner when the mines are operating again.

But the value of wages cannot be assessed, for there is nothing on which money can be spent. The Kulkompanis issue their own currency for the purchase of liquor, cigarettes and the fundamentals at the Kompanis' store, the individual worker's wage account being debited with drawings in the local currency.

Little is known about the interior of these islands except that they wear a thick cap of ice, and much of the coastline has yet to be mapped accurately. Both Russian and Norwegian surveyors were busy on Ice Fjord last summer, and several surveying and geological expeditions will arrive in Spitsbergen this coming spring, their purpose being to select suitable sites for new mines.